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ABSTRACT

This book was written to help teachers to plan and implement an effective multiplication-division basic fact program. When it is determined that children have gained an adequate concept for an operation, the next long-range goal is fact memorization. Children need to respond quickly and correctly to number facts and retain this learning over time. To achieve this goal, instructional suggestions are presented in this teacher resource to help children develop strategies and thinking patterns for answering unknown facts. In contrast to long-standing approaches, readers will note that a different method of grouping and sequencing facts is presented in this teachers resource. This new organization is based on how children can be helped to study and to recall facts. The instructional sequences and activities in this resource relate to memorizing facts which are grouped for recall. A major suggestion made in this resource is to delay studying a group of division facts until related multiplication facts are mastered. Children learn best by manipulating materials which model the thinking to be acquired. Whenever possible, the initial approach with each new set of facts in this resource is hands-on and incorporates oral language prompts. This document includes discussions of the teaching and learning strategies used by this program, sample lessons, activities, extension and modifying activities, home involvement activities, and a list of references. Appendices include jiffy quizzes, materials lists, and card sets for the basic program. (CW)

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Basic Number Facts—

Strategies for Teaching and Learning

Book II: Multiplication and Division

An Activity Based Program

A Teacher Resource
by
Carol A. Thornton

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Dedicated to my husband Denis, and daughters

Stephanie and Jennifer

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Jerry Liebenstein

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Preface

This book is written to help teachers plan and implement an effective multiplication-division basic fact program. When it is determined that children have gained an adequate CONCEPT for an operation, the next long-range goal is fact memorization. Children need to respond quickly and correctly to number facts and retain this learning over time. To achieve this goal, instructional suggestions are presented in this teacher resource to help children develop strategies or thinking patterns for answering unknown facts.

In contrast to long-standing approaches, readers will note that a different method of grouping and sequencing facts is presented in this teacher resource. This new organization is based on ways CHILDREN find easy to study and recall facts. Fact groups such as Clock 5s, Pattern 9s, Break Aparts, and others which may be new to teachers and parents, simplify the learning task for children.

The instructional sequences and activities in this resource relate to memorizing facts which are grouped by strategy for recall. They are the outgrowth of fifteen years of systematic interaction with and research involving children and their teachers in the United States, Australia, and Canada.

A major suggestion made in this resource is to *delay studying a group of division* facts until RELATED multiplication facts are mastered. The rationale is that children will be able to use multiplication to answer or to check division facts only if they know the multiplication facts well. For this reason it generally is desirable NOT to present multiplication and related division facts in the same or in back to back units of instruction. Children need time to consolidate learning before being asked to apply it.

Children learn best by manipulating materials which model the thinking to be acquired. Whenever possible, therefore, the initial approach with each new set of facts in this resource is "hands on." Also, because the internalization of thinking patterns often hinges upon children's abilities to "talk out" as they do and learn, oral language prompts are incorporated to which children can relate.

Examples:

- "See x5 (or÷5)? Think minutes after. The clock helps."
- "See x9 (or ÷9)? What pattern will help?"
- "See an even factor in multiplication? Do half, then double it."

These and other language prompts encourage children to help themselves when they forget and are an important part of the program.

Drill is a necessary element of the instructional suggestions contained in this resource. Recommendations on when and how to provide effective drill and practice in the number fact program are provided.

The author is indebted to the cooperation, dedication, enthusiasm, inspiration and patience of all the children, teachers and administrators; colleagues and assistants; friends and family—whose support has culminated in this attempt to make teaching and learning of basic facts easier and FUN!

Toward a Sound Basic Fact Program: A Philosophy of Teaching

2 x 7, 5 x 3, 9 ÷ 3: A child's ability to quickly and accurately answer these and other number facts is a basic stepping stone to success in other aspects of the elementary school mathematics curriculum. Written and mental computation, computational estimation, and elements of problem solving rely on this skill. Mastery of the basic "number facts" is not always easily and quickly attained. It is not unusual for children in and beyond third grade to finger count or guess to obtain answers to unknown facts.

The school mathematics curriculum today is fuller than ever with demands to provide quality teaching in key areas: problem solving and applications, mental computation and computational estimation; and the processing and interpretation of data, both graphically and with appropriate use of technology. Teachers are being challenged to develop more adequate understandings of mathematical concepts and to build "number sense" in practical and problematic situations.

To help students keep pace with the demands of today's curriculum and allow time for its more challenging aspects, there is a need to be more *efficient* in the teaching and learning of basic facts. Two major questions confront teachers:

- What approaches to number fact learning will bring students to a usable degree of mastery faster and foster better retention?
- What model of fact learning also reinforces concept learning and the development of number relationships; and has a natural extension to mental mathematics and problem solving?

The National Council of Teachers of Mathematics in its *Curriculum and Evaluation Standards for School Mathematics* (1989) has endorsed a model which emphasizes "thinking strategies" for teaching basic facts. Baroody (1985) suggested that this approach to number fact learning and teaching typically provides more effective results than a drill approach alone. These positions are aligned with the theoretical model proposed by Case (1985) which may be used to explain the advantage of the strategy approach for promoting quicker learning and longer retention of basic facts.

Case's information processing model is based on the concept that the capacity of a child's short-term storage space, *working memory* , is limited. His research suggests that the capacity of one's working memory is increased by "chunking"—that is, by grouping or relating data for efficient storage and retrieval. As a result, greater amounts of data can be processed in one's working memory at any given time, and the transfer to long term memory is accommodated.

"Chunking" is the basis of a strategy approach to teaching and learning basic facts. Research evidence since the 1930's (e.g. Brownell & Chazal, 1937; Thiele, 1938; Swenson, 1949; Thornton, 1978; Rathmell, 1978; Leutzinger, 1979; Cook & Dossey, 1982; Thornton & Toohey, 1984, 1985, 1986; Thornton & Smith, 1988) are consistent with NCTM endorsement of this approach.

Teachers themselves are beginning to recognize how effective the "strategy" model of teaching basic facts can be for all types of students. For high ability students, this approach provides an early focus on number relationships, patterning, and related generalizations. For other students, the emphasis on teaching strategies for recall before drill places children in a better position to help themselves when they forget. This emphasis also increases the likelihood that subsequent drills will "speed up" efficient processes instead of cumbersome ones for answering unknown facts.

This author's concern extends beyond the idea of merely teaching isolated strategies to a focus on:

- how carefully each strategy is taught;
- how the various strategies are sequenced;
- how drill is interfaced in a balanced manner in the basic fact program; and
- how number fact work is related to what teachers already are doing to accomplish major goals in school mathematics.

The emerging objective is not only to use techniques, hints, or strategies which help children learn *certain groups of facts* , but also to develop a **sound basic fact program** which:

- will help children learn *all facts* ;
- will emphasize the *process* for determining unknown facts as well as the answer;
- will provide for systematic, on-going drill and practice; and
- will contribute significantly to major goals of today's mathematics curriculum.

This teacher resource has been written from the perspective that it is possible to improve number fact learning in the primary grades in a way which relates to this objective. A major thrust has been to **present a framework** which teachers can use as a springboard for improving their present basic fact program, no matter what mathematics textbook curriculum is used. The six major aspects of this framework are introduced in the section which follows.

A BASIC FRAMEWORK FOR TEACHING AND LEARNING BASIC FACTS: SIX TYPES OF ACTIVITIES

Goal: Fact memorization. Adequate concept understanding is assumed.

For all but very good memorizers, it is helpful to:

Look Ahead
Teach a Strategy
Use the Strategy
Choose What Will Help
Speed Up
Check Up

1. **LOOK AHEAD** to:
   - tomorrow;
   - three weeks from now.

   Build prerequisites which help children learn techniques and thinking patterns for learning unknown facts.

2. **TEACH STRATEGIES** which help children memorize unknown facts. Action-based teaching is the key. Thinking strategies children find helpful are summarized on page 11. Group facts by strategy for recall, rather than by size of factor.

3. Help students **USE** the new strategy accurately.

4. Be sure children can **CHOOSE** when it is appropriate to use the new strategy, and when it is not.

5. Provide short, daily drill activities to **SPEED UP** response to the point of automatic recall. In every classroom to about grade 4 and in remedial settings, daily drill on facts previously presented should occur. Not to do so would be the exception. The tendency is to neglect both addition and subtraction drills while working on multiplication; to neglect multiplication drills when focusing on division. Rather, teachers might plan a short multiplication drill near the beginning of each math period, and a short drill on a different set of facts (addition, subtraction, or division) near the end. Alternately, a short drill might occur at some other transition period during the day.

6. **CHECK UP** on fact mastery through regular six- or eight-point fact quizzes (and occasional, longer timed tests).

Thinking Strategy Terms

1. **Break Apart facts** are those multiplication facts that can derived by breaking one of the factors into two groups.
   Example: 4 x 7 can be broken in half: 2 sevens and 2 sevens.
   Verbal Prompt: "See an even factor? Do half, then double it."
   (See also: Twice as Much facts.)
   Other examples: 6 x 4 can be broken in half OR can be split
   5 fours (20) and 4; 3 x 6 = 2 sixes (12) + 6.

2. **Clock 5s** (multiplication) are those facts with 5 as the second factor.
   Examples: 8 x 5 = 40; 3 x 5 = 15.
   Note: Because Clock 5s and their turnarounds (commutatives) have the same answer, the following hint is helpful.
   Verbal Prompt: "See a 5? Think minutes after."

3. **Clock 5s** (division) are those facts with 5 as the divisor.
   Examples: 35 ÷ 5 = 7; 20 ÷ 5 = 4.
   Verbal Prompt: "See ÷ 5? Think minutes after."

4. **Cut Off facts** are multiplication facts that can be derived by subtracting from a related fact.
   Example: To find 8 x 4, start with 9 fours (36) and subtract 4.
   Use a 9 x 4 grid to model the thinking.
   Cut off (or fold under) one row of four.

5. **Don't Be Blue fact** (6 x 7 = 42) is the multiplication fact that is related to a rhyme about "don't be blue."
   Verbal Prompt: "6 x 7—don't be blue. Turn me over, I'm 42."

6. **Families of facts** are the related facts (multiplication-division) that have the same factors.
   Example: 8 x 3 = 24; 3 x 8 = 24; 24 ÷ 3 = 8; 24 ÷ 8 = 3.
   Verbal prompt: "When you know one, you know all four."

7. **Floor fact** (8 x 8 = 64) is the multiplication fact that can be related to a rhyme about being on the floor.
   Verbal Prompt: "8 x 8 = 64; pick it up it's on the floor."

8. **Grade facts** are those multiplication facts that can be related to the succession of grades in school.
   "Just take the grades in order": 12 = 3 x 4; 56 = 7 x 8.

Verbal Prompt: "Before you go to grades 3 and 4, you complete grades 1 and 2 (in this order). Before you go to grades 7 and 8, you complete grades 5 and 6."

9. **"Miner" fact** (7 x 7 = 49) is the multiplication fact that is related to the California gold rush.
   Verbal Prompt: "During the Gold Rush of 1849, the miners took a pick (draw a 7 on the board) and a spare (draw another 7) to dig for the gold. We'll let these 7's be gold picks to remind us: 7 x 7 = 49. This is the 'miner' fact."

10. **Multiply to Help facts** are those harder division facts for which which easier mnemomics (such as visuals, patterns, or rhymes) are not available. If not known, students typically need to rely on related multiplication facts to solve.
    Examples: 18 ÷ 3 = 6; because 3 x 6 = 18; 24 ÷ 8 = 3 because 8 x 3 = 24.
    Verbal Prompt: "Multiplication gives the answer."

11. **One A Week facts** are those multiplication facts and their turnarounds which can be focused on while studying 2s, 5s, 9s, 0s, and 1s, one or so each week.
    Examples: 8 x 8 (floor fact): 6 x 4, 6 x 6, 6 x 8 (rhyming facts); 3 x 4, 7 x 8 (grade facts); 3 x 3, 3 x 7 (picture facts).
    Verbal Prompt: Varies according to the fact.

12. **Ones** (multiplication) are those facts having 1 as a factor.
    Examples: 9 x 1 = 9; 1 x 3 = 3.
    Verbal Prompt: "x1, stays the same."

13. **Ones** (division) are those facts with 1 as the divisor.
    Examples: 4 ÷ 1 = 4; 6 ÷ 1 = 6.
    Verbal Prompt: "÷1, stays the same."

    Note: Using multiplication is a useful solution strategy for solving all division facts, and should be encouraged. If time is needed to develop the multiplication-divison relationship, or to master related multiplication facts, then visuals, patterns or other mnenomics can readily be used to help children solve easier divison facts.

14. **Partner facts are two related division facts with the same whole and the same factors.**
    Examples: 35 ÷ 5 = 7 and 35 ÷ 7 = 5 are partner facts.
    First one masters an easy group of division facts.

THEN one can use these easier, known facts to help learn a whole new set of harder, unknown facts.

Referring to the example above : Clock 5s are relatively easy for most children. When they are truly mastered, many children can learn to use ÷5s they know to derive answers to related but unknown partner facts like 35 ÷ 7.

Verbal Prompt: "When you know one, you really know two!"
"Same whole. Same factors."

15. **Pattern 9s** (multilplication) are those facts with 9 as a factor.
    Examples: 9 x 4 = 36; 6 x 9 = 54.
    Verbal Prompt: "See x9? What's the pattern?"

16. **Pattern 9s** (division) are those facts with 9 as the divisor.
    Examples: 27 ÷ 9 = 3; 72 ÷ 9 = 8.
    Verbal Prompt: "See ÷9? What's the pattern?"

17. **Photo facts** are the two multiplication facts that can be related to a familiar picture of a tic-tac-toe board or three weeks on a calendar.
    Examples: 3 x 3 = 9; 3 x 7 = 21.
    Verbal Prompt: "Remember! Snap a photo!"

18. **Picture 2s** (multiplication) are facts with 2 as the first factor.
    Examples: 2 x 7 = 14; 2 x 8 = 16.
    Note: Because Picture 2s and their turnarounds (commutatives) have the same answer, the following hint is helpful.
    Verbal Prompt: "See a 2? Think of the picture."

19. **Picture 2s** (division) are facts with 2 as the divisor.
    Examples: 14 ÷ 2 = 7; 8 ÷ 2 = 4.
    Verbal Prompt: "See ÷2? Think of the picture."

20. **Rhyming facts** are those multiplication facts with 6 as the first factor and either a 4, 6, or 8 as the other factor. They produce an auditory pattern when verbally repeated.
    Examples: 6 x 4 = 24; 6 x 6 = 36; 6 x 8 = 48.
    Verbal Prompt: "These facts rhyme when you say them."

21. **Square facts** are those multiplication facts with identical factors. A graph paper grid illustration of any of those facts is a square region.
    Examples: 6 x 6 = 36; 2 x 2 = 4; 8 x 8 = 64.
    Verbal Prompt: Varies for each fact.

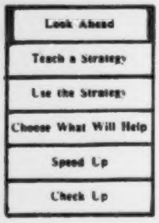
22. **Turnarounds** are multiplication commutatives.
Examples: 6 x 8 = 48 and 8 x 6 = 48.
Verbal prompt: "Turnarounds in multiplication have the same answer. When you know one fact, you really know two."

23. **Pair** is a term used to refer to related multiplication-division facts.
Examples: 35 ÷ 5 = 7 and 5 x 7 = 35 are pairs.
(5 x 7 = 35 is the "multiply to check" fact for 35 ÷ 5 = 7.)
Verbal prompt: "When you know multiplciation, you know division, too." We encourage children to "pair up" (multiply) to check division answers.

24. **"Twice as Much" facts** (multiplication) are those "harder" multiplication facts whose answers are twice those of easier, known facts.
Examples: 4 x 6 (2 x 6 = 12, so 4 x 6 is twice as much: 24.)
6 x 3 (3 x 3 = 9, so 6 x 3 is twice as much: 18.)
Verbal prompt: "See an even factor? Do half, then double it."
(See also: Break Apart facts.)

25. **Zero facts** are found in all operations. The following list hightlights how zero facts are treated in each operation.

Operation	Verbal Prompt	Examples
+ Zero Facts	"+ 0 makes no change."	4 + 0 = 4; 0 + 4 = 4.
- Zero Facts	"Take none," or "Take all."	4 - 0 = 4; 4 - 4 = 0.
x Zero Facts	"x 0, always 0."	4 x 0 = 0; 0 x 4 = 0.
Zero Facts in division	"Nothing to share, so you get nothing." "÷ 0 is NOT ALLOWED"	(0 ÷ 8 = 0). (A No! No!)



LOOK AHEAD Activities in the Basic Fact Program . . .

. . . to teach or review important prerequisites.

LOOK AHEAD—to tomorrow, to three weeks from now. What basic facts are unknown and need to be memorized? Some students in our classes are "good memorizers" and need only be told to "study." We typically can anticipate that other students will have difficulty memorizing certain facts.

Concept understanding and place value concepts and skills are assumed to be very important prerequisites to any memory work with facts. If teaching or reteaching is required, it is helpful to plan ahead so that when the time comes to help students learn strategies for remembering certain groups of facts, teaching will flow smoothly.

Check Concept Understanding

Memory work for facts should begin only when children reasonably understand the concept for each operation involved. Checking whether children have developed "operation sense" involves teacher observation and probing in several related situations.

- Given a "real world" multiplication or division problem, can children physically model or "talk through" the problem in a meaningful way?

- Given a written expression such as 3 x 4 or 15 ÷ 3, do children exhibit understanding of the factor-factor-whole concept in the way they talk through or physically model finding a solution?

- After children write an answer to a simple number combination, can they:
  - use countable objects or a graph paper grid drawing to show the answer "makes sense"?
  - tell, write or draw a story based on numbers from the problem?

- Given a mix of oral problems based on situations common to their experience, can children tell which operation button on a calculator could be used to solve the problem?

Children's understanding of the concept of multiplication or division can grow as their experiences give them a broader basis for comparison and use. Children gain a greater perspective on multiplication, for example, when they begin to grasp its relation to division. It takes time for children to recognize and use relationships like the effect on the product of increasing a factor by one, or the inverse relation between multiplication and division.

Similarly, it takes time for children to develop a broad conceptual base and adequate skills related to place value and "number sense." Many of the thinking patterns encouraged in this resource relate to students' abilities to recognize certain patterns and relationships between numbers. Children who have been encouraged to explore and investigate relationships between numbers more readily approach number fact work from a problem solving perspective: "I don't know the answer to that one, but I can work it out."

Providing ample time for appropriate concept-building experiences related to the operation—multiplication or division—and to number is critical. Each year anew, it is important to slow the shift to fact memory work to attend to these important prerequisites.

Review or Teach Other Prerequisites

In addition to concept and number work, it is important to systematically check, then review or teach other important prerequisites to success. These prerequisites include the following skills:

For MULTIPLICATION, check:	To help later with:
1. Mastery of clock times (to the nearest five minutes).	Clock 5s
2. Sight recognition of finger patterns.	Pattern 9s
3. Ability to subtract a 1-digit number from a multiple of 10.	
4. Ability to add two 1-digit numbers to "make 9".	
5. Ability to double two 2-digit numbers mentally.	Break Apart Facts

For DIVISION, check:	
1-2 above.	Clock 5s and Pattern 9s
3. MASTERY OF RELATED MULTIPLICATION FACTS.	Harder Division Facts

TEACHING AND LEARNING STRATEGIES in the Basic Fact Program: What Will Help?

Help students master unknown facts. Group facts by strategy for recall, then explicity teach strategies which make memorization easier. The following strategies have proved helpful to many students. The sample multiplication and divison lessons in this resource teach these strategies.

Useful Strategies for Learning Unknown Multiplication Facts

Popular strategy	Samples of these facts
• See x2? Think of the picture.	Picture 2s (2x6, 2x9,...)
• Think of the turnaround.	2x6=12 and 6x2=12
• See x5? Think minutes after.	Clock 5s (3x5, 8x5,...)
• x0 always 0.	Zeros (0x3, 1x0,...)
• x1, stays the same.	Ones (4x1,1x5,...)
• See x9? What's the pattern?	Pattern 9s (4x9,9x7, ...)
Break Apart Facts:	
• See an even factor? Do half, then double it.	• For 4x6, just double 2x6.
• Add to a known fact.	• For 3x6, start with 2 sixes (12) and add 6.
• Subtract from a known fact.	• For 8x4, start with 9x4 and subtract/cut off 4.

Useful Strategies for Learning Unknown Division Facts

Popular Strategy	Samples for these facts
• See ÷2? Think of the picture.	Picture 2s (12÷2, 18÷2,...)
• Think of the partner fact.	12÷2=6 and 12÷6=2
• See ÷5? Think minutes after.	Clock 5s (20÷5, 35÷5, ...)
• See ÷9? What's the pattern?	Pattern 9s (81÷9, 63÷9, ...)
• 0÷ is a 0; ÷1, stays the same.	Zeros and Ones (0÷2, 5÷1,..)
• Multiplication gives the answer.	Other division facts (18÷3, 28÷7, ...)

Facts Grouped By Strategy For Recall*

100 Multiplication Facts**

Easy Facts (90)

- Picture 2s (15): 2 x (2,3,4,5,6,7,8,9)
- One a Week Facts (15): 3x4, 7x8; 3x3, 3x7; 6x4, 6x6, 6x8; 6x7; 8x8
- Clock 5s (13): 5 x (3,4,5,6,7,8,9)
- Zeros (19): 0 x n (n = any number, 0 through 9)
- Ones (17): 1 x n (n = any number, 1 through 9)
- Pattern 9s (11): 9 x (3,4,6,7,8,9)

Harder Facts (9)

- Break Apart Facts(9): 4x (4, 7, 8); 6x3, 8x3

Last Fact (1)

- Miner fact: 7x7

90 Division Facts

Easy Facts (65)

- Picture 2s (8): (18, 16, 14, 12, 10, 8, 6, 4) ÷ 2
  - Partners (7): 18÷9, 16÷8, 14÷7, 12÷6, 10÷5, 8÷4, 6÷3
- Clock 5s (7): (45, 40, 35, 30, 25, 20, 15) ÷ 5
  - Partners (6): 45÷9, 40÷8, 35÷7, 30÷6, 20÷4, 15÷3
- Pattern 9s (6): (81, 72, 63, 54, 36, 27) ÷ 9
  - Partners (5): 72÷8, 63÷7, 54÷6, 36÷4, 27÷3
- Zeros (9): 0÷n; Ones (9): n÷1=n
  - Partners (8): n÷n = 1
  - (n = any number, 1 through 9)

Harder Facts (25)

- Squares (5): 64÷8, 49÷7, 36÷6, 16÷4, 9÷3
- Multiply to Help facts (20): (56,48,32,24) ÷ 8; (56,42,28,21) ÷7; (48,42,24,18) ÷6; (32,28,24,12) ÷ 4; (24,21,18,12) ÷ 3

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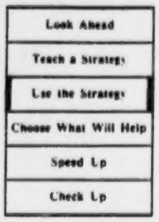
*Once facts are introduced in Teach Strategy, Choose, and Use activities, include them systematically in daily Speed Up activities.

**Includes multiplication turnarounds.



USE Activities in the Basic Fact Program

After children have learned a strategy for deriving answers to a group of unknown facts, a first instructional emphasis is assuring that they are *using* the technique or thinking pattern correctly. In recognition of this goal, a class of activities identified as "USE" activities follow the teaching of every strategy in this teacher resource.

USE activities are transitional in the sense that they move the child slowly away from the concrete objects or pictures typically used to model or stimulate efficient thinking patterns in the TEACH STRATEGY activities. A frequent tactic is to have children write answers to unknown facts, then use these objects or pictures only to check their answer. This approach reinforces the desired thinking pattern and typically nurtures further understanding for the operation involved.

USE activities are characterized by frequent use of the verbal prompts highlighted beneath the title of each of the sample lessons in this resource. The TEACH STRATEGY discussion on page 12 summarizes these verbal prompts, which serve as verbal clues for thinking quickly and efficiently to derive answers to unknown facts.

Look Ahead
Teach a Strategy
Use the Strategy
Choose What Will Help
Speed Up
Check Up

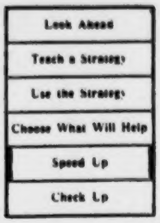
CHOOSE Activities in the Basic Fact Program

Throughout the sample lessons of this resource, CHOOSE activities are incorporated to further reinforce retrieval strategies which have been taught. The focus of these activities is to assure that children can select appropriate strategies for solving facts they do not know. CHOOSE activities characteristically place children in decision making situations. Examples include:

- "Select and do just the Squares on this page."
- "Hold thumbs up if the card I show is a Pattern 9."
- "From the multiplication cards on the chalk tray, find the fact that checks the division fact you picked up when you came into the room. ... Good! 16 ÷ 8 = 2 because 8 x 2 = 16."

During CHOOSE activities, teachers frequently use thinking strategy terms like those on pages 5-8. They give verbal prompts when children need them like those highlighted beneath the title of each sample lesson to reinforce the thinking pattern or strategy being developed.

When carrying out CHOOSE activities with children, teachers are encouraged—as always—to be accepting of correct, efficient alternative strategies children propose for deriving answers to unknown facts. More capable students tend to use more sophisticated thinking patterns than other children.



SPEED UP Activities in the Basic Fact Program

The goal of this teacher resource is to help children MEMORIZE basic multiplication and division facts. Teaching and learning retrieval strategies and incorporating related Use and Choose activities is a means to this end. It is not and end in itself.

When it is clear that children know how to derive answers to unknown facts in an efficient and accurate manner, the instructional emphasis then shifts to drill and practice. The key is **balance.** If instruction moves too fast, efficient thinking patterns and techniques will not be internalized and used by the children. On the other hand, if instruction moves too slowly through the easier facts in any given school year, there is little time left for help where children need it most: on the harder facts yet to be learned.

In addition to pacing, a second issue arises: that related to *daily* drill. A common tendency is to neglect multiplication facts while division is being studied; or to lay both addition and subtraction facts aside while introducing multiplication. This is not recommended.

Throughout the primary and into the intermediate grades children need regular, systematic review on number facts. **"Less is best, more often."**

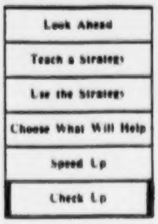
From this author's perspective, once a group of facts has been presented through Strategy, Use, and Choose activities, those facts should be systematically included in a brief, daily drill activity or exercise.

When number facts for all four operations have been introduced in a school year, the recommendation is to rotate the focus of the *daily* drill periods, so that number facts from all operations are systematically included. Typically, number facts from different operations would not be mixed in an activity or exercise until facts are mastered. These drills might occur as part of or separate from the math period.

Toward this end some teachers keep a shoebox of flashcards handy for those brief, sometimes unexpected moments of free time which occur during transition periods throughout the day. Cards could include many topics: reading vocabulary, spelling words, . . ., and math facts. Some teachers write directions for a fun SPEED UP activity on the lead card of each set of facts. At a moment's notice, this SPEED UP activity can be carried out by the teacher (or substitute teacher).

General guidelines for drill and practice which have been incorporated into the SPEED UP activities of this resource are given below. The assumption is that, in general, the "best" drill is that which:

- Comes after Look Ahead, Teach Strategy, Use, and Choose activities.
- Is carried out on a daily basis.
- Is short.
- Is motivating . . .and varies a bit, one day to the next. (Avoid using flash cards in the SAME WAY, day after day. Be creative!)
- Actively engages ALL students. (Note that popular activities like "Around the World" and most team activities do not do this. Only the person responding or the next in line is forced to stay on task.)
- Involves the mind set that: "I'm here to memorize these facts." (Child's perspective)
- Emphasizes: "I know you can do it!" (Teacher's perspective)
- Deemphasizes hints and clues; emphasizes speed.
- Focuses on only a few new facts along with other, easier, review facts during a session.
- Systematically includes all facts previously memorized.
- Provides immediate/quick feedback on whether a response is correct, and makes the correct answer available.
- Praises students for their EFFORTS to memorize.
- Is tied to an assessment of student progress. (Refer to the CHECK UP ideas below, particularly to ideas for using the Class Cross Out Chart.)



CHECK UP in the Basic Fact Program

Quizzes and timed tests are used to assess student progress toward learning the basic facts. The following questions are those asked most frequently by teachers relative to this assessment.

1. **When are facts "mastered"?**

   Basic fact mastery involves giving *correct* answers *quickly* (normally within 2 seconds), and being *consistent* in this performance over time. Any assessment in the area of basic facts would consider these criteria.

2. **What do written timed tests really tell us about fact mastery?**

   Unless individually monitored, these tests only tell the number of facts a child can correctly answer within a given length of time. They don't tell us which facts are memorized and which are calculated. They don't tell us *how* answers to unknown facts are derived. They do provide a good starting point for instructional planning by indicating which students are "pretty good" and which students need a lot of help in the area of basic facts.

3. **What is the role of longer timed tests (40-100 facts)?**

   These tests are most useful for up front diagnostic assessment and for occasional general achievement testing of basic fact mastery. For example, one might give such a test about the second or third week of school to determine fact retention over the summer and to assist with instructional planning.* At the end of a semester or just after the Christmas break this test might be readministered to determine long term retention or progress. These tests would not be given on a daily basis.

Blackline masters for longer, timed number facts tests in multiplication and division are provided on the following pages. A 2-minute time limit for multiplication and a 3-minute limit for division is suggested. When time is up, consider letting children use a different color pen or pencil to finish other problems they would like to do on the page.

4. **How much time should be allowed for timed tests?**
The time allowed should be a function of children's normal writing speed. These speeds vary due to differences in age and motor coordination. An individual's writing speed can be determined by counting the number of digits a child normally can write in one minute. A child who can write fifty digits per minute should be able to write answers to thirty basic facts per minute. This time allocation takes into account 2-digit vs. 1-digit responses.

---

* If you review a few retrieval strategies and do a little fact practice before giving the first fact test with returning students, they'll have a better chance of regaining their summer loss and come away from the test with a better attitude toward fact work for the year.

Name____

Do The Easy Ones: Multiplication*

Quickly answer all those you know. It's all right to skip the hard ones.

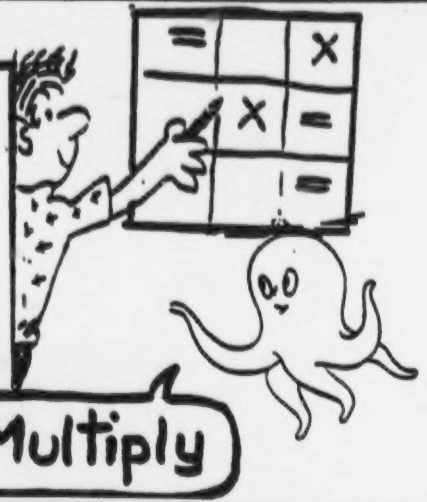
3 x 3 = ____
4 x 4 = ____
0 x 4 = ____
4 x 9 = ____
4 x 8 = ____
2 x 2 = ____

8 x 1 = ____
3 x 5 = ____
8 x 9 = ____
3 x 9 = ____
8 x 8 = ____
7 x 6 = ____

2 x 3 = ____
4 x 3 = ____
3 x 4 = ____
7 x 7 = ____
4 x 7 = ____
2 x 5 = ____

$$\begin{array}{r} 0 \\ \times\ 6 \\ \hline \end{array} \qquad \begin{array}{r} 5 \\ \times\ 9 \\ \hline \end{array} \qquad \begin{array}{r} 8 \\ \times\ 6 \\ \hline \end{array} \qquad \begin{array}{r} 5 \\ \times\ 6 \\ \hline \end{array} \qquad \begin{array}{r} 2 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \times\ 5 \\ \hline \end{array} \qquad \begin{array}{r} 2 \\ \times\ 6 \\ \hline \end{array} \qquad \begin{array}{r} 5 \\ \times\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ \times\ 8 \\ \hline \end{array} \qquad \begin{array}{r} 9 \\ \times\ 9 \\ \hline \end{array}$$



2 x 8 = ____
8 x 7 = ____
5 x 7 = ____
4 x 6 = ____
3 x 7 = ____

3 x 8 = ____
6 x 7 = ____
5 x 8 = ____
1 x 5 = ____
6 x 6 = ____

5 x 5 = ____
7 x 9 = ____
3 x 6 = ____
6 x 6 = ____
7 x 8 = ____

Name ____

Do the Easy Ones: Division*

Quickly answer all those you know. It's all right to skip the hard ones.

9 ÷ 3 = ____
6 ÷ 3 = ____
16 ÷ 4 = ____
42 ÷ 7 = ____

4 ÷ 2 = ____
24 ÷ 3 = ____
0 ÷ 7 = ____
4 ÷ 4 = ____

42 ÷ 6 = ____
8 ÷ 1 = ____
45 ÷ 5 = ____
35 ÷ 7 = ____
48 ÷ 6 = ____

40 ÷ 5 = ____
27 ÷ 3 = ____
10 ÷ 2 = ____
36 ÷ 9 = ____
56 ÷ 8 = ____

8)40 3)21 7)14 1)0 6)54 4)24 6)30 5)25

4)20 9)81 9)63 7)49 1)2 4)12

4)8 3)12 9)81 3)15 6)6 6)12

4)32 9)54 3)0 3)18 7)21 1)1

56 ÷ 7 = ____
32 ÷ 8 = ____
35 ÷ 5 = ____
18 ÷ 9 = ____

28 ÷ 4 = ____
16 ÷ 8 = ____
64 ÷ 8 = ____
27 ÷ 9 = ____

18 ÷ 6 = ____
72 ÷ 8 = ____
36 ÷ 6 = ____
28 ÷ 7 = ____

5. **What is the role of short "jiffy" quizzes in testing mastery of basic facts?**

Evaluation is tied to teaching. Hence, a first level of assessment in the area of basic facts relates to children's mastery of each new group of facts studied (Clock 5s, Pattern 9s, . . .). When students have had the chance to investigate cues and hints for remembering a group of facts, and have had opportunity for practice, both oral and written quizzes could be used. JIFFY QUIZZES are good for this purpose. These quizzes are:

- Short—containing only six or eight facts.
- Frequent—even daily over a period of several days.
- Limited at first only to the new facts being studied.

Cumulative review quizzes test retention over time. We recommend that JIFFY QUIZZES again be used for this purpose.

A set of Jiffy Quizzes matching the strategies developed in this resource are contained in Appendix A. This appendix contains:

- Fun Quiz (3 sheets)
- Multiplication 1 through 14
- Division 1 through 13

The first multiplication quiz is generic in the sense that it can be adapted to any set of fact. The other 13 multiplication and 13 division quizzes are keyed to strategy, with cummulative review of facts from "easier" strategies.

Suggestions for using these quizzes follow.

Fun Quiz: Distribute the appropriate quiz section for the month. Show and say a number fact, pause two seconds, then say the answer. Children try to write the correct answer before you say it. If they succeed, they complete the drawing. At the end, the total number of problems answered correctly is recorded. *Quizzes like this can create healthy attitudes and less test anxiety. Ocassionally give facts but no answers; collect and grade the papers for a "real" quiz.*

Note: Early in the year or in work with a particular group of facts, the 2-second time pause could be extended, then gradually reduced to criterion.

Multiplication 1: This quiz sheet can be readily modified to fit most fact groups being studied. It is also useful for quick review. After distributing the sheet (or portions of it, cut on a dotted line), tell students what numbers that should be entered across a row as factors.

Examples: "Write 2 as a factor across the first row; write 5 as a factor across the second row." OR, "Write these numbers: 2, 5, 9, 2, 5, 9, 0, 1. Ready to multiply? Go!"

Multiplication 2-14 and Division 1-13:

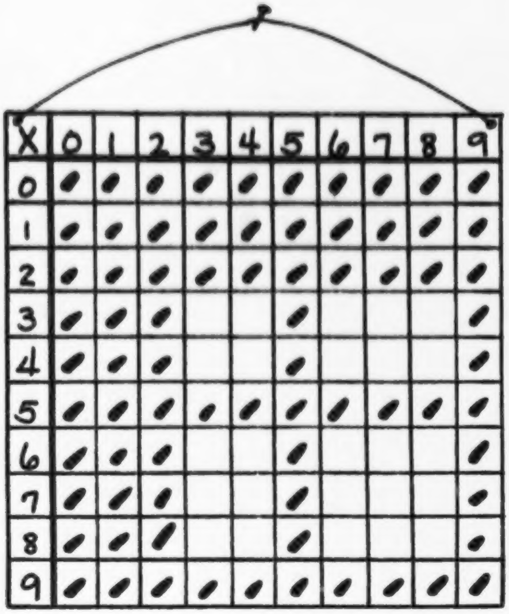
The code in the upper right corner indicates which facts are being assessed. For shorter quizzes, use only one row each day, and collect for reuse. For longer 16 or 24 fact quizzes, cut on the dotted line. Each quiz sheet contains the harder facts in the strategy group identified by the code.

6. What are alternatives for tracking progress during fact learning?

It is important to keep students attuned to their progress and goals for improvement. To many children, the task of memorizing basic facts seems endless! When Jiffy Quiz scores make it apparent that most students in the class have memorized a group of facts, the recommendation is to mark these facts off the CLASS CROSS OUT CHART. It is so motivating to children for them actually to SEE the progress they are making!

Class Cross Out Chart

Hang the chart on the wall or from the chalkboard. Flip the chart to the opposite side during quiz or test sessions. Picture 2s, Clock 5s, Pattern 9s, 0s, and 1s are marked off on the sample chart below.



X	0	1	2	3	4	5	6	7	8	9
0	●	●	●	●	●	●	●	●	●	●
1	●	●	●	●	●	●	●	●	●	●
2	●	●	●	●	●	●	●	●	●	●
3	●	●	●			●				●
4	●	●	●			●				●
5	●	●	●	●	●	●	●	●	●	●
6	●	●	●			●				●
7	●	●	●			●				●
8	●	●	●			●				●
9	●	●	●	●	●	●	●	●	●	●

As goals are set with children for the year, a teacher working with beginners in multiplication and division might want to code certain facts on the class Cross Out Chart as "challenge" facts. These are facts which children may learn beyond the required expectations.

The *average* beginner, for example, might be expected to learn all the "easy" multiplication or division facts in a school year, but not a few harder facts like 8 x 3 or 8 x 4. In every classroom, however, there are some few capable students who will take the "challenge" and learn them all! The goal is to encourage good students without discouraging others.

Individual Cross Out Sheets

Letting children keep **individual** Cross Out sheets is another way of keeping students apprised of their progress. A blackline master for multiplication and for division are provided on the next page. The sheet can be cut, glued onto cardstock, and used by students as bookmarks in their mathematics books.

Allow very low level students to keep the Cross Out Sheets at their desks for seatwork, homework, and tests (except for basic fact or standard tests). This approach will lesson their dependence on inefficient or inaccurate habits and will help them be less frustrated in their work. It will also allow teachers to see what the students CAN do, when facts are not an issue. All the while, time is gained for teaching strategies to help students master unknown facts and "catch up" with others in the class.

Multiplication Cross Out Sheet

x0
0 x0 =0
1 x0 =0
2 x0 =0
3 x0 =0
4 x0 =0
5 x0 =0
6 x0 =0
7 x0 =0
8 x0 =0
9 x0 =0

x1
0 x 1 =0
1 x 1 =1
2 x 1 =2
3 x 1 =3
4 x 1 =4
5 x 1 =5
6 x 1 =6
7 x 1 =7
8 x 1 =8
9 x 1 =9

x2
0 x2 =0
1 x2 =2
2 x2 =4
3 x2 =6
4 x2 =8
5 x2 =10
6 x2 =12
7 x2 =14
8 x2 =16
9 x2 =18

x3
0 x3 =0
1 x3 =3
2 x3 =6
3 x3 =9
4 x3 =12
5 x3 =15
6 x3 =18
7 x3 =21
8 x3 =24
9 x3 =27

x4
0 x4 =0
1 x4 =4
2 x4 =8
3 x4 =12
4 x4 =16
5 x4 =20
6 x4 =24
7 x4 =28
8 x4 =32
9 x4 =36

x5
0 x5=0
1 x5=5
2 x5=10
3 x5=15
4 x5=20
5 x5=25
6 x5=30
7 x5=35
8 x5=40
9 x5=45

x6
0 x6=0
1 x6=6
2 x6=12
3 x6=18
4 x6=24
5 x6=30
6 x6=36
7 x6=42
8 x6=48
9 x6=54

x7
0 x7=0
1 x7=7
2 x7=14
3 x7=21
4 x7=28
5 x7=35
6 x7=42
7 x7=49
8 x7=56
9 x7=63

x8
0 x8=0
1 x8=8
2 x8=16
3 x8=24
4 x8=32
5 x8=40
6 x8=48
7 x8=56
8 x8=64
9 x8=72

x9
0 x9=0
1 x9=9
2 x9=18
3 x9=27
4 x9=36
5 x9=45
6 x9=54
7 x9=63
8 x9=72
9 x9=81

Glue to 4 x 6 Index Card

Division Cross Out Sheet

÷0
÷0
IS
NOT
ALLOWED

÷1
1 ÷1 =1
2 ÷1 =2
3 ÷1 =3
4 ÷1 =4
5 ÷1 =5
6 ÷1 =6
7 ÷1 =7
8 ÷1 =8
9 ÷1 =9

÷2
2 ÷ 2 =1
4 ÷ 2 =2
6 ÷ 2 =3
8 ÷ 2 =4
10 ÷ 2 =5
12 ÷ 2 =6
14 ÷ 2 =7
16 ÷ 2 =8
18 ÷ 2 =9

÷3
3 ÷3 =1
6 ÷3 =2
9 ÷3 =3
12 ÷3 =4
15 ÷3 =5
18 ÷3 =6
21 ÷3 =7
24 ÷3 =8
27 ÷3 =9

÷4
4 ÷ 4 =1
8 ÷ 4 =2
12 ÷ 4 =3
16 ÷ 4 =4
20 ÷ 4 =5
24 ÷ 4 =6
28 ÷ 4 =7
32 ÷ 4 =8
36 ÷ 4 =9

÷5
5 ÷ 5 =1
10 ÷ 5 =2
15 ÷ 5 =3
20 ÷ 5 =4
25 ÷ 5 =5
30 ÷ 5 =6
35 ÷ 5 =7
40 ÷ 5 =8
45 ÷ 5 =9

÷6
6 ÷ 6 =1
12 ÷ 6 =2
18 ÷ 6 =3
24 ÷ 6 =4
30 ÷ 6 =5
36 ÷ 6 =6
42 ÷ 6 =7
48 ÷ 6 =8
54 ÷ 6 =9

÷7
7 ÷ 7 =1
14 ÷ 7 =2
21 ÷ 7 =3
28 ÷ 7 =4
35 ÷ 7 =5
42 ÷ 7 =6
49 ÷ 7 =7
56 ÷ 7 =8
63 ÷ 7 =9

÷8
8 ÷8 =1
16 ÷8 =2
24 ÷8 =3
32 ÷8 =4
40 ÷8 =5
48 ÷8 =6
56 ÷8 =7
64 ÷8 =8
72 ÷8 =9

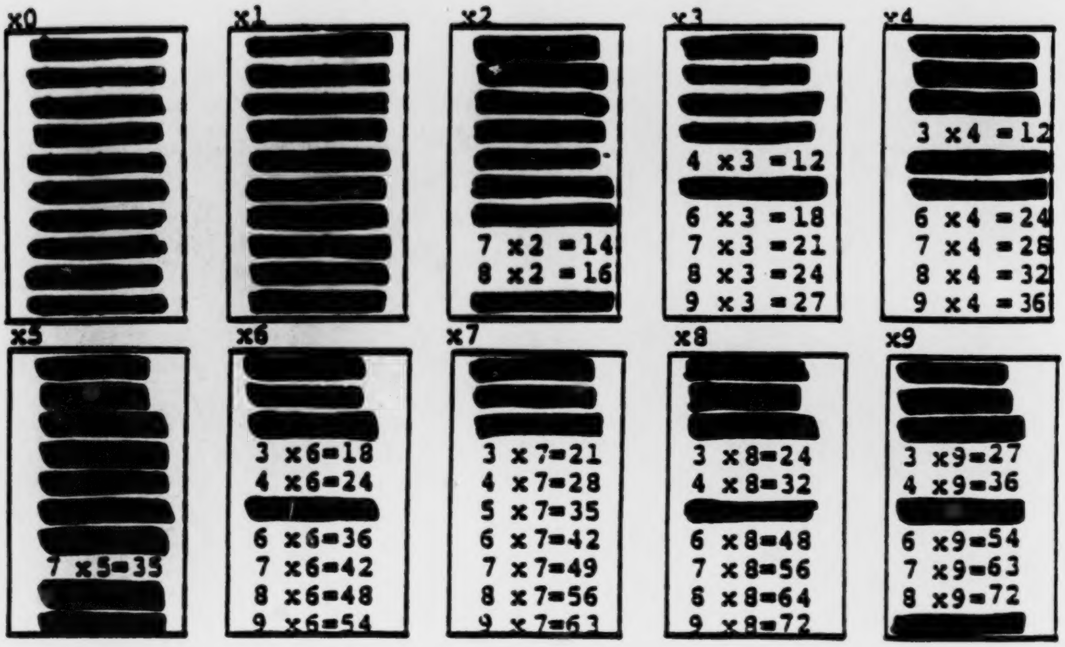
÷9
9 ÷ 9 =1
18 ÷ 9 =2
27 ÷ 9 =3
36 ÷ 9 =4
45 ÷ 9 =5
54 ÷ 9 =6
63 ÷ 9 =7
72 ÷ 9 =8
81 ÷ 9 =9

Glue to 4 x 6 Index Card

*See suggestions for use, pages 24 and 27.

After testing children individually **cross out** boldly, as in the sample below, **all those facts which a student knows well.** If a child *counts quickly* and can derive a correct answer within two seconds, cross it out. This two-second criterion for mastery typically can be met only when the fact is truly memorized or when short counts are involved. Long counts will involve a child beyond two seconds.

Multiplication Cross Out Sheet

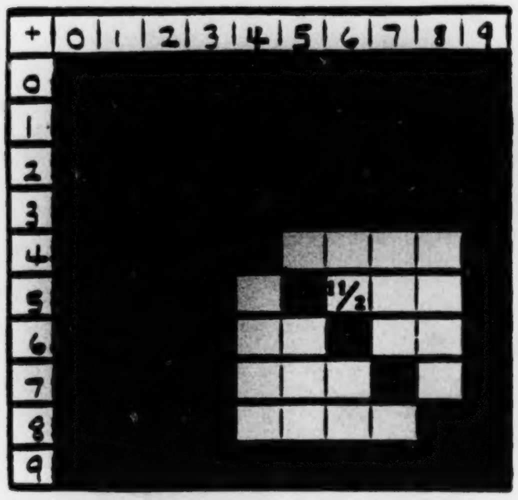

x0
x1
x2
7 x2 =14
8 x2 =16
x3
4 x3 =12
6 x3 =18
7 x3 =21
8 x3 =24
9 x3 =27
x4
3 x4 =12
6 x4 =24
7 x4 =28
8 x4 =32
9 x4 =36
x5
7 x5=35
x6
3 x6=18
4 x6=24
6 x6=36
7 x6=42
8 x6=48
9 x6=54
x7
3 x7=21
4 x7=28
5 x7=35
6 x7=42
7 x7=49
8 x7=56
9 x7=63
x8
3 x8=24
4 x8=32
6 x8=48
7 x8=56
8 x8=64
9 x8=72
x9
3 x9=27
4 x9=36
6 x9=54
7 x9=63
8 x9=72

Keep Cross Out Sheets current. Set weekly, individual goals for students using the sheets. Select several facts for study which have a common strategy for recall. For example, "This week, use the pattern to learn 9s you don't know." Help students when you can during the week and, if possible, ask parents to help.

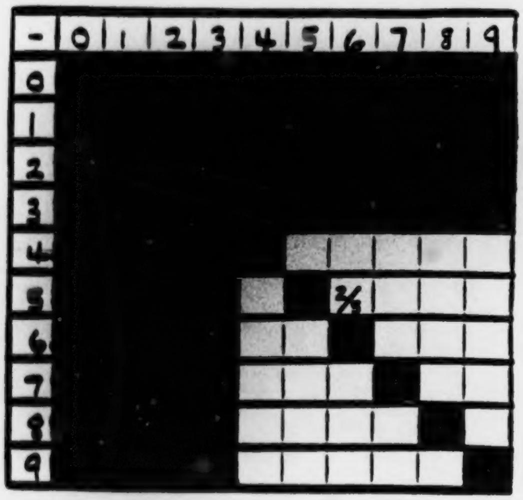
At the end of the week, give a short quiz over facts that have been set for study. Include review facts as well, to determine whether students "know" the new facts well, even when randomly mixed with others. Given that you have set reasonable goals, several facts can be learned and crossed out each week.

With some special needs students, CONSISTENCY in performance, one day to the next, is a problem. In these special cases, use a yellow highlighter to cross out facts after a first testing. Then, if the same problems also are answered correctly at a second testing, cross them out boldly.

Teachers may find it helpful to keep their own copy of children's Cross Out Sheets. Knowing exactly which facts these students know will help the teacher emphasize these facts in class examples and in available free moments with individual children. Teachers can keep duplicates of each student sheet or use recordkeeping forms like those on the following page for this purpose. The samples below illustrate how to use these forms. Facts "known" at the time of testing are blackened. (A) indicates that the fact 5 x 6 was learned and crossed out on November 2 (11/2). According to (B), the fact 36 ÷ 4 was crossed out on February 5 (2/5).



(A)



(B)

Alternative Recordkeeping Forms for Teachers

Mark off facts that children know.*

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Child's name______________

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Child's name______________

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Child's name____________

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Child's name______________

*See suggestions for use, p. 27.

Facts Students Know

After individual testing, circle products (or dividends) of facts a child knows. The number 18 circled in the "2" row means 2 x 9 (multiplication) or 18 ÷ 2 (division fact).

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

Child's name_______________

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

Child's name_______________

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

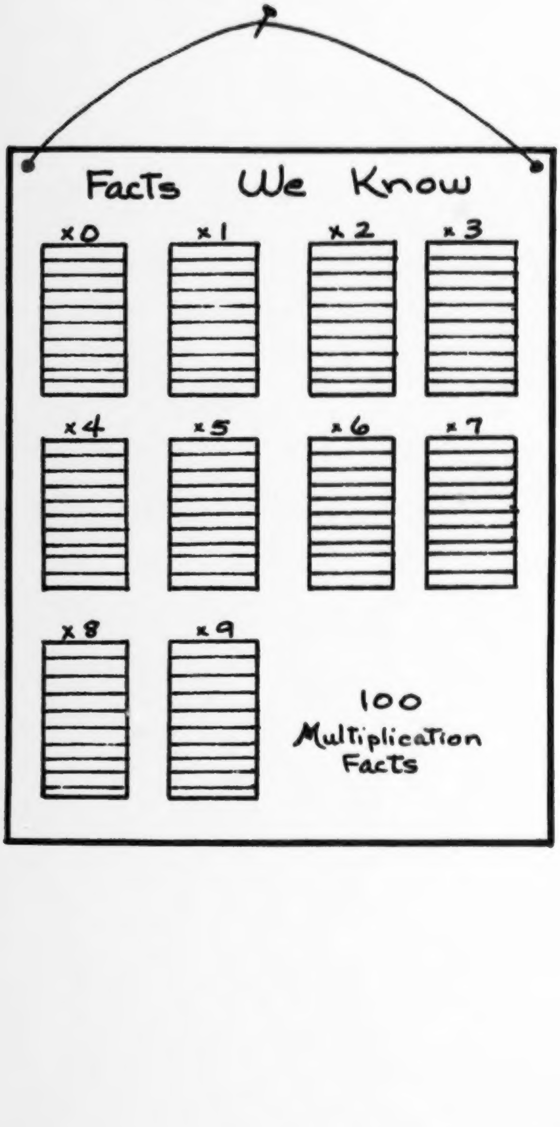
Child's name_______________

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

Child's name_______________

In a regular classroom, using individual Cross Out sheets will be mangeable only with four or five students—those most in need. An alternative for other students is to have them keep a personal bar graph or record of the number of correct answers on basic fact quizzes. Some teachers follow the policy that if three perfect scores are accumulated by a student in a week, then the child does not have to sit for further basic fact quizzes that week.

Build Up Lists



Another alternative is to help students create a class or an individual "Build Up" list like that shown. In a class setting, as students master a group of facts, they can be written onto a poster sized chart.

(Hang on a wall or from the chalkboard. Flip to the opposite side during quiz or test sessions.)

Getting Started:
Diagnostic Planning

Look Ahead
Teach a Strategy
Use the Strategy
Choose What Will Help
Speed Up
Check Up

The following guidelines may prove useful as you look ahead to plan your multiplication-division number fact program for the year.

Check Concept Understanding

A program stressing fact memorization naturally starts with a concept check for each operation involved. Given a written number fact, can a child use objects in a meaningful way to derive answers? Or at a higher level, if the child "knows" the correct answer, can objects be used to show that an answer provided makes sense? A first basis for checking concept understanding is using objects in relation to what is written. Other suggestions for checking concept understanding are included in the Look Ahead section of this resource.

The major point is that instruction should not shift to memory work until children have had time to explore an operation in problem solving contexts through direct modeling and other informal approaches. In the meantime, emphasis on other prerequisite skills—like those identified in the Look Ahead section should be checked as a first step to diagnostic planning for basic fact mastery.

Select The Starting Point

Diagnostic assessment plays an important role in "getting started" at the beginning of a year's number fact program and with each new group of facts as work progresses throughout the year. After opportunity for review, it typically is useful to give students a timed test or otherwise assess which facts are known and which are difficult.

The blackline masters for "Do the Easy Ones," provided on pages 19 and 20, or flash cards may be used for whole class or individual testing of students. If a written, timed test if given, allow students to finish the test using a pen or colored pencil after time is up. This approach lessens the frustration many students feel at not being able to finish and provides important diagnostic information.

When you need to know specifically which facts can be answered correctly and quickly (within two seconds), and which are not mastered—it will be necessary to test students individually. Individual settings provide the opportunity to observe every response made by a child. The information obtained from either a written or an oral quiz is particularly useful for dealing with transfer or low level students.

Other observations can provide valuable imput for program planning. In general:

- What strategies are used by children to answer unknown facts? (Do they count? Use relationships between known and unknown facts? Guess? . . .)
- Are strategies used by children accurate? Efficient?

After testing, a Class Cross Out Chart or Individual Cross Out Sheets can be used for recording purposes, diagnostic planning, and tracking. These recordkeeping devices and suggestions for using them are described in the Check Up section.

Analyzing the Class Cross Out Chart or Individual Cross Out Sheets will help determine the starting point for those individuals in the ongoing program.

- Which facts do children know well?
- Which facts can children answer--but slowly?
- Which facts are clearly unknown?

When dealing with individuals, it is possible to get very specific answers to these questions. Otherwise, a general class profile derived from analyzing quiz results and verbally interacting with students will provide the needed information.

It will be necessary to organize facts children have not mastered in some systematic way for study. The Teaching Sequences section, preceding the sample multiplication lessons, provides suggestions for selecting and sequencing groups of facts for study. In general, for both multiplication and division, "easy" facts are studied before "hard" ones. Further, work with harder division facts is delayed until students master related multiplication facts. This approach increases the likelihood of students using multiplication to answer unknown divison facts.

An Activity Based

Multiplication-Division

Number Fact Program

Teaching Sequences for Multiplication and Division Facts: Overview

Build Prerequisites

When one thinks of teaching sequences, the first thing that comes to mind is prerequisites. The Look Ahead section (p. 11) identified major concepts and skills that lead to success in the multiplication and division basic fact program. Typically, it is necessary to review these prerequisites early in the school year, even for returning students, because there is a great deal of loss over the summer. Helping students clarify their understanding of the CONCEPT of multiplication or division before turning to memory work is a particularly important goal.

Determine Multiplication-Division Sequences

"Easy before hard." This is the key. The major recommendation when planning basic fact work for the year is to identify:

- Easy Multiplication facts;
- Easy Division facts;
- Harder Multiplication facts;
- Harder Division facts.

One grouping of "easy" versus "harder" facts is given on page 12.

Teachers who have used the lessons and ideas of this resource for multiplication typically start with 2s, them turn to 5s, 1s, 0s, and 9s. If their students cannot read a standard clock to the nearest 5 minutes, they delay treating the 5s.
Along with each set of these easy facts, teachers identify certain "One a Week" facts for students to study. A sample sequence follows.

Easy Multiplication Facts

With this set of facts ⇓	Also study One a Week Facts and their turnarounds ⇓
Picture 2s (15 facts)*	Rhyming 6s: 6x4=24. 6x6=36, 6x8=48.
Clock 5s (13 facts)	Grade facts: 12=3x4, 56=7x8.
0s	Floor fact: 8x8=6.
1s	Don't be blue fact: 6x7=42.
Pattern 9s	Photo facts: 3x3=9, 3x7=21
	TOTAL = 90 easy facts.

In the sequence above, multiplication 3s and 4s are not studied as separate groups of facts. Students are pleased when they analyze the Class Cross Out Chart and realize how many of these and other harder facts they have learned as turnarounds (commutatives) of Picture 2s, Clock 5s, and other easy facts.

A good wrap-up activity on the 90 easy multiplication facts is to take time with the class to mark them off the Class Cross Out Chart. "This is what we have studied and what most of us know well." Teachers next can present easy division facts and harder facts for both operations.

Delay Division

You will note the implied suggestion in these comments to DELAY DIVISION until related multiplication facts are learned. In order to accomplish this goal, teachers would NOT treat multiplication and related division facts in the same or in back-to-back units of instruction.

In the long run it is better to turn to other curricular topics "in between" to allow students time to learn one group of facts well before introducing another which builds on it. How can students use multiplication to check or, even better, to derive answers to divison facts unless *they know the multiplication facts well?* The suggestion is to thread number fact work slowly but systematically throughout the year, rather than providing such a heavy dose in any one period of time that fact mastery is neither reasonable nor obtained.

---

*Turnarounds are included.

Watch Pacing

A suggestion coming from teachers who have used the sample lessons of this resource is to pace instruction so that, within the year, there is enough time to help students where they need it most: with the harder facts. The tendency is to spend too much time on the easy facts, to the eventual neglect of the harder facts.

Suggestions for Adapting the Adopted Text Book Series

What if your school district's program or adopted textbook series does not present ideas like those presented here and in the sample lessons? In our experience, *it still is possible to take a systematic, strategy-based approach to helping children master basic multiplication and division number facts.* The major modifications necessary will be:

- To delay division until related multiplication facts are learned. This typically will require treating other topics or chapters before going back to division work.
  The goal is to provide students the opportunity to learn multiplication facts to mastery. They then will be in a better position to use multiplication to answer unknown division facts.
- To ask children just to do those problems on a page that "fit" a newly-learned strategy. For example, "Just do the Pattern 9s on this page."

This approach allows teachers to use and reuse textbook pages which sequence facts differently than suggested in this resource. Teachers also may consider doing more "Multiply to Check" work, as in the sample division lessons, before treating fact "families" such as 6 x 8 = 48, 8 x 6 = 48, 48 ÷ 6 = 8, 48 ÷ 8 = 6. It usually will be necessary to supplement textbook suggestions and provide more fact practice on an on-going basis.

Since many textbook publishers are now adopting a strategy approach to teaching basic facts, the ideas of this resource and particularly those in the sample lessons which follow, should prove to be a useful supplement to the school adapted program. Specific suggestions on instructional strategies for using the sample multiplication lessons follow.

Look Ahead
Teach a Strategy
Use the Strategy
Choose What Will Help
Speed Up
Check Up

USING THE MULTIPLICATION AND DIVISION SAMPLE LESSONS

The following two sections contain sample lessons which teachers have found useful for helping children memorize multiplication and division number facts. The Reference section of this resource lists several journal reports related to the use of lesson ideas by these teachers and their students.

Each sample lesson is structured using the six aspects of the framework presented earlier in this resource:

- Look Ahead
- Teach a Strategy
- Use the Strategy
- Choose What Will Help
- Speed Up
- Check Up

For most students in every class, all six types of activities are necessary for promoting relatively quick mastery and long-term retention.

On the other hand, what about those one or more students in every class who memorize easily and don't need to be "shown how" to do so? Clearly, children who know a group of facts should not be required to "use a strategy" to derive answers! Thinking strategies suggested in the sample lessons are a means to an end. They are not ends in themselves. In our experience and for the following reasons, however, even bright students who memorize quickly have enjoyed and benefitted from the approaches taken in this resource:

- Most activities are "hands on";

- Strategies often involve visual cues or mental thinking patterns which these students enjoy; and

- In the spirit that "less is best, more often," number fact work frequently occupies only *small portions* of a class period.

Perhaps the major consideration when dealing with all children, including those who learn quickly, is to be flexible and open to students' ideas while presenting thinking strategies. We suggest and encourage, in an effort to lead children using inefficient approaches to adopt quicker, more efficient methods of learning. Still, we accept alternate, correct approaches and refrain from imposing one mode of thinking on all. Every time we tune in on the way students are thinking, we learn something! Sometimes we learn they need our suggestions; sometimes we learn they are more sophisticated than we may have given them credit!

The Daily Lesson: Major Focus and Minor Focus

The overriding goal of the sample lessons is to achieve memorization, or automatic recall of the 100 multiplication and 90 division facts. Toward this end, facts are grouped by strategy for recall, and lesson suggestions are given for teaching these recall *strategies* to children.

On those days Strategy activities are introduced, number fact work would normally be the central or MAJOR FOCUS of the math lesson. On most other days following this introduction, entire class periods typically are not needed. Basic fact work would be the MINOR FOCUS, threading the curriculum, while the major part of the period could be devoted to unrelated work: place value, money, time, geometry, measurement, fractions, or other topic.

Teaching the Lessons

Each sample lesson presents an activity sequence for learning a group of number facts. Some lessons for easy facts like Zeros may be taught, start to finish, in one period. Other lessons involving a greater number or more difficult facts may be spread out over a week or more.

The first consideration before actually teaching any lesson is to look ahead far enough to insure that prerequisite concepts and skills are intact. These prerequisities are summarized on page 11, and those which specifically apply are listed at the beginning of each sample lesson. The need to assure that children know related multiplication facts before beginning a division lesson also is critical.

Most Strategy and some Use and Choose activities require manipulatives. These are used at first to model and later to check the thinking pattern or approach being developed. A summary of materials needed for each lesson is given in Appendix B. Many teachers extend this list as they modify existing or insert additional activities for the sample lessons. First activities in a lesson tend to be teacher directed, with suggestions for small group or cooperative learning. With the exception of occasional checks, manipulatives related to strategy work are dropped in each lesson when the instructional thrust shifts to Speed Up work. A mix of teacher-directed and small group or independent activity is included in these practice activities.

Ideas for modifying basic activity suggestions for children with special learning needs are given in a section following the sample lessons. Suggestions given provide ideas for reaching children through their learning strengths, and offer additional insights for helping children compensate for specific learning deficits.

Many of the activities throughout each lesson call for individual chalkboards. Alternatives to using chalkboards are considered in Appendix B, and suggestions for care and storage are given. With the exception of counters and classroom materials, which most teachers have readily available, only the card sets provided in Appendix C are required for carrying out the lessons. Directions for using these cards are summarized in Appendix C and also appear, where appropriate, throughout the lessons.

The Rainy Day and Bulletin Board Activities sections, following the sample lessons, provide ideas for on-going review and practice of facts. Sample letters to parents, provided in the Home Involvement section, suggest ideas for home communication related to the number fact program. A rule of thumb regarding fact work and homework is to wait until children have nearly completed a lesson and are into Speed Up before involving parents or requiring children to study a particular group of facts at home.

The Jiffy Quizzes of Appendix A are tied to the Check Up work of each lesson. Suggestions regarding Check Up and the use of a Class Cross Out Chart on which facts are marked off as studied were given earlier in the section on Check Up. As children become comfortable with a group of facts, it is important to extend fact work to involve children in decision making, patterning, and mental math activities, as suggested in Extensions of the Basic Fact Program following the sample lessons.

Multiplication:

Sample Lessons

- Picture 2s
- Special Facts: "One a Week"
- Clock 5s
- Zeroes and Ones
- Pattern 9s
- Break Apart Facts
- Squares and the "Miner" Fact

Instructional Strategies for Helping Students Memorize Multiplication Facts

Guidelines for using the seven sample multiplication lessons of this section are given below. These guidelines have emerged over a period of several years, from suggestions given by teachers using the lesson ideas.

1. **Start early.** It is quite all right to start on multiplication facts before all addition and subtraction computation work is completed. Teachers of returning students, in particular, will not want to wait until second semester to start multiplication. Besides the summer lag, students otherwise also will have the fall semester lapse between the previous year's introduction to multiplication and the current year treatment of the topic.

2. **Take the Look Ahead suggestions seriously.** It will not be possible to successfully teach a thinking strategy for which underlying prerequisites are not intact.

3. **Take the sequencing suggestions seriously.** Do "easy" facts first, but remember: it is not necessarily the size of the factors which make a set of facts "easy." The thinking pattern or strategy involved in deriving the facts is more at issue.

4. **Use the verbal prompts.** Give each set of facts a "name": Clock 5s, Pattern 9s, Break Apart Facts, and so on. This language is helpful to students because of the retrieval strategies it suggests.

5. **Engage students in studying the turnarounds (commutatives) of facts in each group studied.** Help them to realize that "When they know one fact, they really know two!"

6. **In remedial situations, "Clump" the teaching of thinking strategies.** For example, work on Clock 5s and Pattern 9s at the same time—though not necessarily in the same instructional period. Perhaps study one set during the last few minutes of the regular math period, and find 10 minutes to study a different set of facts at some other time during the day.

7. **Use the manipulative approaches embedded in the activities.** A successful number fact program involves more than just oral and written work.

8. **Watch pacing.** Move slow enough to help students develop thinking strategies for working out answers to facts they do not know. But move relatively fast through easier facts so there is time in the year's program to help students with the harder facts that need most time and help.

9. **After teaching a strategy, and engaging students in Use and Choose activities, provide daily practice on new facts and on-going, systematic review of other facts previously studied.**
   - Students need to hear the teacher say, "You know a thinking strategy for working out the answers to these facts. Now I want you to try hard to memorize the answers, and use the thinking strategies as a back-up when you just can't remember. This is the major goal of daily practice."

- It is important to continue practicing addition and subtraction facts, even though the thrust now is on multiplication number fact work. Alternate the focus of short (3-to 5-minute) drill and practice sessions, so that addition and subtraction work is included at least every other day.
- See the Speed Up ideas in each lesson and the Speed Up section of this resource for general suggestions related to drill and systematic review.

10. **Extend practice work into active learning bulletin boards and challenge students to apply number fact work to problem solving and mental math.** Much of this activity reinforces concept work for multiplication. See the sections on Active Learning Bulletin Boards and Extensions of Basic Facts in this resource.

11. **If possible, communicate with parents and elicit their support.** Share appropriate Thinking Strategy Terms and ideas with them so they can better follow up on what you are doing. See specific suggestions in the Home Involvement seciton of this resource.

12. **As part of the Check Up phase of each lesson, cross the multiplication facts just studied off the Class Cross Out Chart.** It is important that students as well as the teacher have a sense of how much has been learned and what facts remain to be studied. As suggested in the Check Up section of this resource, allow remedial students to use Individual Cross Out Sheets for daily work and tests, to provide them the extra time they need to master unknown facts.

Picture 2s

Verbal Prompt: "See a 2? Think of the picture."

Picture 2s are: 2x2,... 9x2; Including turnarounds, this lesson focuses on 15 facts.

Look Ahead Mastery of addition doubles is nice. A clear understanding of the multiplication concept is essential.

Teach a Strategy Because most students know addition doubles, the multiplication 2s tend to be very easy. Use pictures to help students learn any of these facts they find difficult. Visual mnemonics are faster than skip counting. When memorizing facts is the goal, skip counting is not recommended.

* *Double Trouble.* (Materials: Cards for Picture 2s, Appendix C.) Use the picture cards only for multiplication 2s which students do not know. If they are familiar with the pictures from addition, have students write first the addition fact for a picture, then the Picture 2 multiplication fact beside it.

If the pictures are new to students, then present up to three new pictures in a day. Name each fact by its picture. Verbal prompts for each fact are given below. They are listed sequentially even though most teachers prefer to mix easier with harder facts when teaching.

Verbal Prompts for Individual Facts

- 2 x 2—the car fact. See the wheels: 2 twos, 4 in all.
- 2 x 3—the clover (or peanut) fact. See two leaves: 2 threes, 6 in all.
- 2 x 4—the spider fact. See the legs: 2 fours, 8 in all.
- 2 x 5—the fingers fact: 2 fives—10 in all.
- 2 x 6—the dozen fact. See the eggs: 2 sixes, 12 in all.
- 2 x 7—the two week fact. Count the days: 2 sevens, 14 in all.
- 2 x 8—the crayon fact: 2 rows of eight, 16 in all.
- 2 x 9—the double 9 domino fact: 2 nines, 18 in all. (OR note that there is one loop in "9," and two loops in two "9's.". There also are two loops in the answer—just examine the 8!)

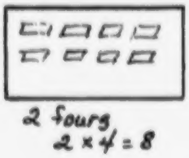
If possible, before presenting the pictures, use real objects to introduce each picture and link to the written fact.
For example: Examine a calendar on which the first day of the month is a Sunday. Get students to finger loop 2 weeks or 2 sevens: the first 14 numbers, then to write the matching fact: 2 x 7 = 14.

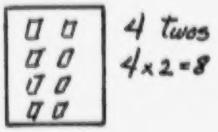
Turnarounds

Verbal prompt: "When you know one, you really know two."

Teach a Strategy

* *Same Answer, Both Ways.* (Materials: Egg carton; calendar; lego board or dot card, as shown.)





Have students write the multiplication fact for 2 weeks: 2 x 7 = 14. Then get them to note that the calendar also shows 7 twos for these two weeks: 2 Sundays, 2 Mondays... up to 2 Saturdays. Have them write the multiplication fact for this situation: 7 x 2 = 14. Write the 2 facts side by side on the board and comment: "Same 2 weeks, 2 different ways. Same product, the factors are just turned around. These two facts are turnarounds. Picture

2s and their turnarounds have the same answer. When you know one, you know the other, too." *You may wish to introduce the term commutative at this point. Depending on the age of the students, some teachers delay introducing formal terminology.*

Note: Because students are familiar with addition turnarounds, introducing the idea early in the multiplication sequence typically causes no problem. Teachers dealing with children who are developmentally slow or have learning difficulties may wish to delay this introduction until later, after Speed Up activities for multiplication 2s have been carried out. In this case, do not include turnarounds in any of the following activities. Rather, after introducing turnarounds at a later time, repeat the activities and include them then.

Use the Strategy

- *What Do You See?* (Materials: Individual chalkboards and flash cards for Picture 2s.) Order the cards ahead of time so that answers fall into some pattern.

Examples: 10, 12, 14; 10, 12, 14...;
or 16,10; 16,6; 16, 8;...(a difficult fact is repeated);
or 18,16,14; 18, 16,14; ..and so on.

As you show and read each card, students should write the answers (reasonably small) on their chalkboards. They should show their answer each time, but should not erase until they identify and circle the repeating pattern. Reinforce any "difficult" fact with its verbal prompt .

Reorder cards and do another round. (Alternately, during successive rounds, write facts on the board as you read them.)

- *Super Star!* (Materials: Super Star cards from Appendix C—select just those for Picture 2s.) Follow directions given in Appendix C for using this card set. Focus on matching picture, written fact, and answer.

Variation: As each match is made, one player could be called upon to say or write the turnaround and its answer.

Choose

* *Hold 'Em High!* (Materials: Flash cards for Picture 2s and other facts which students have not studied yet this year.) As cards are flashed, students keep both hands on their desks until is Picture 2 is flashed when they hold both hands high over their heads. Call on one child to answer the fact and describe the matching picture.

Speed Up

* *Telephone 2s.* (Materials: Pages from an old telephone book; lined or square centimeter paper [use the grid for Break Apart facts, Appendix C] and pencil; calculator or answer key for x2 facts.

x	7	3	8	3	6	5	4
2	14	6	16	6	12	10	8

Let students pair up and take turns selecting any telephone number that doesn't have the digits 0 or 1. Both students copy this number onto their paper. When the student who selected the telephone number says "Go!", both students race to multiply each telephone digit by 2 as shown. The winner of each round earns a tally point. Play until teacher calls time. Students use a calculator or answer key when needed to check or settle differences.

Check Up

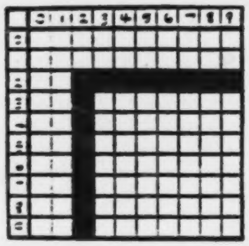
Appendix A: Jiffy Quizzes:
- Fun Quizzes
- Multiplication 1,2,3ff

FOCUS ON the following facts and their turnarounds:

2x2, 2x3, . . . 2x9
. . . and other facts previously studied.

(Continue systematically to review addition and subtraction facts)

When most students have mastered these facts, mark them off the Class Cross Off Chart.



Special Facts: One A Week

One a Week Facts are: 3x4, 7x8: "grade" facts; 6x.(4, 6, 8): "rhyming facts"; 8x8 "floor fact"; 3x3, 3x7 "photo facts"; 6x7: ."Don't be blue" fact. If students cannot mentally add 16+16, also include 8x4: "The Cut Off Fact". It is suggested that, one or so each week, students study facts like those above while focusing on the "easy" multiplication facts.

Look Ahead Check for:

- A clear understanding of the multiplication concept.

Rhyming Facts

Verbal prompt: "These facts rhyme when you say them."

Teach a Strategy * *They Rhyme!* **[6x (4,6,8)]** Point out that for the even factors 4, 6, and 8—the 6s rhyme: 6 x 4: 24; 6 x 6: 36; 6 x 8, 48. Let students tap out the "beat" of the auditory pattern on their desks.

Use the Strategy * *Get the Beat!* (Materials: Cards for each rhyming fact and its turnaround.) When students leave the room for lunch, gym, music, or other function, write 24, 36, and 48 in random order along the chalkboard. As students enter the room, point to those who should pick up a rhyming 6 number fact card. Each student stands by the chalkboard answer to the card selected and, at teacher's cue, leads the class in reading and tapping out the beat to the rhyming 6 fact. After each rhyming 6 fact is said, the child with the turnaround card shows, reads, and answers it.

Choose. * *Thumbs Up!* (Materials: Flash cards for rhyming 6s, their turnarounds and other known facts.) Have students hold thumbs up and answer any rhyming 6s and turnarounds of these facts which they see; thumbs down otherwise.

* *Finish the Beat!* As in *Get the Beat*, but include other 2-digit answer numbers on the board as distractors.

Photo Facts

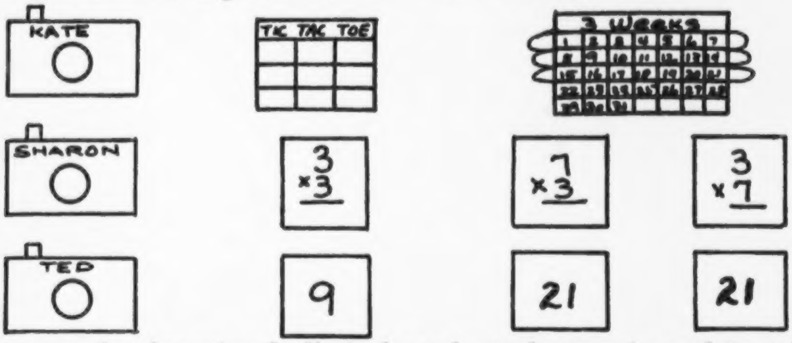
Named by Chris Bohne

Verbal prompt: "Remember! Snap a photo!"

Teach a Strategy * *Snap a Photo!* [3x3, 3x7] (Materials: Old calendar pages which have the first day of the month on a Sunday.) Work separately with 3 x 3 (the tic tac toe fact) and 3 x 7 (the three week fact). If students are not familiar with the picture for 3x3, let them play tic tac toe and discuss the 9 positional options for X and O. For 3x7, create a display for calendar weeks: one week, 7 days; two weeks, 14 days; three weeks, 21 days ...

Each time, after studying the picture, have students close their eyes. See the picture in your mind? To remember, snap a photo with the camera of your eyes. (Or actually take a photograph and display it.) Have students state and write the photo fact and, for 3 x 7, its turnaround.

Use the Strategy * *Patch and Snap.* (Materials: Construction paper cameras, labeled with each child's name; photo facts [include the 7 x 3 turnaround], pictures, and answer cards.)



As an active learning bulletin board, students mix and "patch" picture, fact cards and answer cards as shown. They then snap a picture by pinning the camera bearing their name by the display. The next student mixes the cards before patching them.

Choose * *Who Has It?* (Materials: Teacher made flash cards in which 3x3 and 3x7 facts appear quite often among other known facts.) Distribute the cards to students. Say, "Who has a... Clock 5?" (...Pattern 9 ...Rhyming fact? ...the Tic Tac Toe fact? the 3-week fact?...) Each time, students who have a fact requested should stand, answer the fact when you call on them, then trade facts with someone who is sitting.

Floor Fact

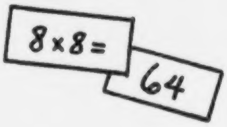
Verbal prompt: "8 x 8 = 64; pick it up it's on the floor."

Teach a Strategy

* *It's On the Floor.* **[8x8]** (Materials: Teacher made cards for "8x8" and "64": several cards for each, answer and fact.) Approach a student with an "8x8=" and a "64" card in hand. Ask the student to read the cards. As the student says "64," let this card drop to the floor. Say, "Pick it up, it's on the floor." Then ask the student to write fact and answer on the board, and direct other students to copy it. Repeat until students sense the rhyme in what is said: "8x8 = 64; Pick it up, it's on the floor."

Use the Strategy

* *Pick It Up!* (Materials: The cards from *It's On the Floor.*) Tape or pin the card sets about the room as shown. As you pass these cards during the next few days, throw the "64" on the floor. As you pass individual desks, periodically ask, "What's 8x8?" Those who give a correct answer should "Pick it up *(point to a specific card)*, it's on the floor."



Choose

* *Time!* (Materials: Mathematics textbook.) Give students five seconds to copy and answer all the "floor facts" they find on a given page. When time is up, call on individuals to help locate these facts on the page, say and answer them aloud.

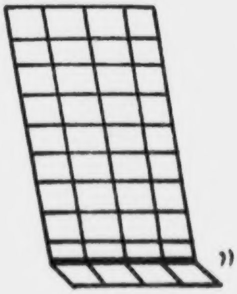
The Cut Off Fact

Verbal prompt: "Just 4 less than something you know!"

Teach a Strategy

* *Cut off 4*. [8x4] (Materials: Grid paper [could use that provided in Appendix C for Break Apart facts], crayons.) Have students draw and cut out a rectangle having 9 rows of four squares each. Review 9 fours = 36, and write 9 x 4 = 36 on the board.

Ask students to use crayon to mark off 8 rows of four. Show students how to fold and unfold on the crayon line to illustrate 9 fours = 36, so (cut off by folding one row under) 8 fours = 4 less (32). Write this new fact on the board beside 9x4 = 36. Then write its turnaround and emphasize that "When you know one, you really know two facts."



Use the Strategy

* *Cover!* (Materials: Tape, graph paper rectangle from *Cut Off* 4.) In the center of the rectangle students should write: "9x4=36, so 8x4 = 32," and tape it to their desks. As you pass individual desks throughout the next few days, say "Cover! " At this cue the child should put a hand over the facts and tell you what is covered ("9x4 = 36, so 8x4 = 32.") Occasionally have students illustrate by folding one row under, or state and answer the turnaround.

Choose

* *Clap On It!* (Materials: Flash cards for 8 x 4, 4 x 8 and other review facts; envelope of digit cards: 1 through 9 [two cards for each] and 0.) Students place the cards 1 through 9 (ten's digits) down the left edge of their desks; and the digits 0 through 9 (one's digits) down the right edge of their desks.

When a card is flashed, they clap and say the answer if it is the Cut Off fact or turnaround. They otherwise pull digit cards to the center of their desks to form each answer. *Make certain that the Cut Off fact and its turnaround appear quite frequently.*

Grade Facts

Verbal prompt: "Just take the grades in order: 12 = 3 x 4; 56 = 7 x 8!"

Teach a Strategy

* *Grade Facts.* [3x4, 7x8] and their turnarounds. Say, "You have friends in grades 3 and 4. What grades were they in before that?" (Emphasize order: grades 1 and 2, then grades 3 and 4. Relate to the numbers in: **12=3x4.** Also point out how students complete, *in order*, grades 5 and 6, then grades 7 and 8. Relate to the numbers in: **56=7x8.**)

Use the Strategy

* *School Days.* (Materials: Cards with the facts 3 x 4, 4 x 3, 7 x 8 or 8 x 7 written on them. As students enter the room, point to those who should select a card. Students with cards pair up to form "schools."

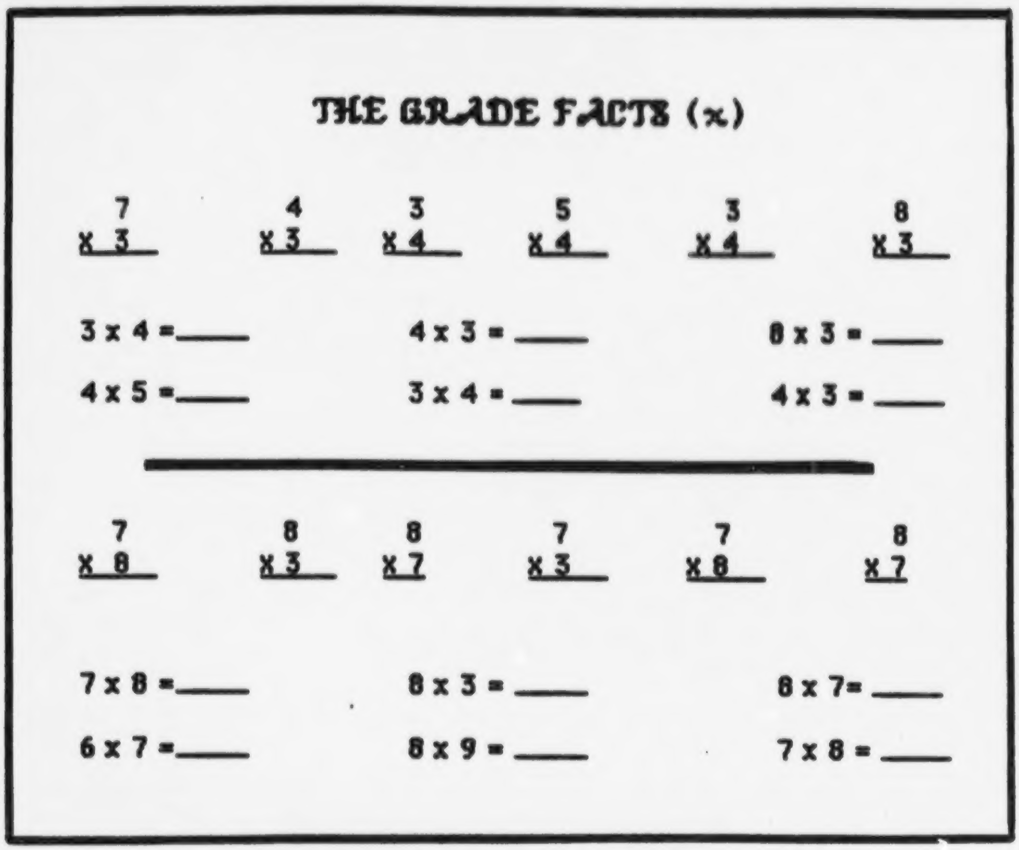
Examples: 3 x 4 and 7 x 8; or 3 x 4 and 8 x 7;
or 4 x 3 and 7 x 8; or 4 x 3 and 8 x 7.

Every time each of the digits (grades) 1 through 8 is represented.

At the teacher's cue, students from a "school" show, read and answer their fact. Other students could be directed to copy facts as they are given. Teacher's commentary can emphasize that whether you are thinking of grades 7 and 8 or 8 and 7 (for example), *in order* students first must complete grades 5 and 6. This order cues the answer "56" for the 7 x 8 fact and its turnaround.

Choose

* *Circle and Do.* (Materials: Worksheet like that shown above .) Follow through by asking students to write answers to the grade facts they circled. Then challenge students to see how many grade facts they can find in one minute on given text pages in their math book.



THE GRADE FACTS (x)

7	4	3	5	3	8
x 3	x 3	x 4	x 4	x 4	x 3

3 x 4 = ____ 4 x 3 = ____ 8 x 3 = ____
4 x 5 = ____ 3 x 4 = ____ 4 x 3 = ____

7	8	8	7	7	8
x 8	x 3	x 7	x 3	x 8	x 7

7 x 8 = ____ 8 x 3 = ____ 8 x 7= ____
6 x 7 = ____ 8 x 9 = ____ 7 x 8 = ____

Some Teachers Create Their Own!

Linda Pauk has shared this idea.

Teach a Strategy Verbal prompt: "6 x 7, don't be blue. Turn me over, I'm 42."

* *Don't be Blue!* (Materials: Small paper, blue and orange crayons.)

Have students use a blue crayon to write 6x7 on their paper. "Draw a sad face there if you like, it's a hard fact....Turn the paper over. Use orange crayon and write 6x7 = 42. Draw a happy face on this side because I gave you the answer."

Front	**Back**
6x7 ☹	6x7=42 ☺

"Now turn the paper to the blue side...6x7--don't be blue. Turn me over, I'm 42!"

Use the Strategy

* *Hide It!* (Materials: Small paper and tape.) Have students write the "Don't be Blue" fact and two other hard facts on a small paper. (The "Don't be blue" fact may be the only fact common to all cards, because individual students will find different facts "hard.") As you pass a student during the day, take a few seconds to say: "Hide It!" Follow immediately by saying a fact you saw on the card. Frequently, though not always, give "6x7" for the child to answer, and follow through with the verbal prompt if the child hesitates.

Front	Back
5x8=40 6x7 13-5=8	6x7=42

Choose

* *Simon Says.* (Materials: Individual chalkboards.) Give directions like: "Simon says, write the "Don't be blue" fact." "Simon says, write a rhyming '6' fact." Students write and answer facts on their boards, then show their work. Occasionally leave out the phrase, "Simon says," upon which students should do nothing (Simon didn't say!).

* *Super Star!* (Materials: Super Star cards from Appendix C—select the "Don't be blue" and other review facts.) Follow directions given in Appendix C for using this card set. Focus on matching picture or clue, written fact, and answer.

Variation: As each match is made, one player could be called upon to say or write the turnaround and its answer.

Activities like the following would follow CHOOSE AND USE work for all One a Week facts.

Speed Up

* *Tell Me.* (Materials: Small pieces of note paper; tape.) Ask students to write three facts from this lesson—with answers—on paper and tape it to their desks. As you pass individual desks during the next few days, cover the paper and say: "Tell me,what's...?" (Name one of the facts.) Draw a star beside each fact answered correctly. Provide new paper for different One a Week facts as children master the first three.

* *I'm Calling.* (Materials: Flash cards for One a Week facts and others previously studied.) Distribute the cards to students and say, "I'm calling for all products in the 40s." (...above 55; ...that are even; and so on). Students holding a fact requested stand, give the answer, and trade cards with someone who is seated.

* *Hot Potato.* (Materials: Bean bag; individual chalkboards.) Let students take turns being catcher for a round of 8 facts. Say a fact then throw the bean bag to the catcher. Give the answer when the bag is caught. Students earn tally marks by writing the correct answer before it is given. Students should show their work each time. Appoint team captains (boys vs girls, row or group vs each other) to keep track of "winners"--those with 6 points per round or better).

Check Up

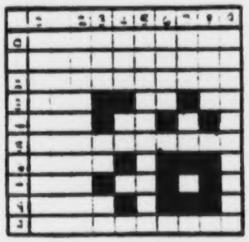
FOCUS ON the following facts and their turnarounds:

Appendix A: Jiffy Quizzes:
- Fun Quizzes
- Multiplication 1; 2ff

3x4, 7x8; 6x (4, 6, 8); 8x8;
3x3; 3x7; 6x7; 8x4;

... and other facts previously studied.

When most students have mastered these facts, mark them off the Class Cross Off Chart.



Clock 5s

Verbal Prompt: "See x5? Think minutes after."

There are 13 Clock 5s students have not previously studied in this sequence: 3x5, ... 9x5 — and their turnarounds.

Look Ahead Ability to tell time on the clock (5-minute intervals *after* the hour).

Teach a Strategy **Reminder:** Skip counting involves more steps than thinking of the clock as a visual mnemonic. When memorizing facts is the goal, skip counting is not recommended.

- *The Clock Helps.* Students used to "skip counting" on their fingers will relate well to the clock model if you let them place their fingers on the rim of a small clock and skip count around the clock rim.

- *3-6-9.* (Materials: Individual clocks and flash cards 5x (3,6,9).) One by one, repeatedly show the 3x5, 6x5, and 9x5 cards and have students show and tell the clock time to "match" (15, 30 or 45 minutes after the hour). Provide feedback: ... "Yes, 3 x 5 is 15. We can think of the minute hand on the 3 and 15 minutes after."

- *Count On or Back.* (Materials: Demonstration clock and individual chalkboards.) Use the clock to demonstrate how 3, 6, and 9 x 5 can help with other facts. For example, since 6 fives are 30, then 5 fives are 5 less (25) and 7 fives are 5 more (35). In a similar manner, derive 4 x 5 and 8 x 5. Then, as you move the minute hand on the demonstration clock, have students write (and show you) pairs of related facts on their boards: 3x5=15, 4x5=20; 9x5=45, 8x5=40; 6x5=30, 5x5=25, 7x5=35.

Use the Strategy

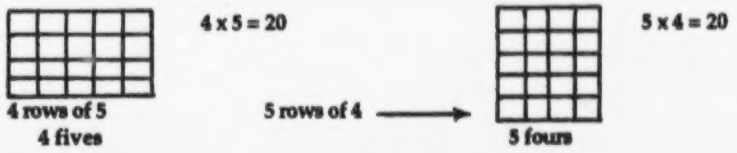
- *What's the Time?* (Materials: Demonstration clock and flash cards for numbers x5.) Distribute the cards to students. As you move the hand to a 3, 6, or 9, students with flash cards "related" to the clock time shown should stand and take turns answering their fact. Reinforce as needed: "Good, 3 fives are 15, so 4 fives are 20 (move clock hand to show)." When correct, students trade cards with someone who is seated.

- *Mix and Match.* (Materials: Clock 5 cards, Appendix C; individual chalkboards.) Place the fact cards randomly along the chalk ledge. Distribute the clock cards. As you read a fact, the student with the matching clock card tries to say the answer before others WRITE and SHOW it on their slates. The clock card is then placed aside the fact card on the ledge.

Clock 5s help with Turnarounds

Teach a Strategy

- *Same Answer, Both Ways.* (Materials: Grid paper [could use that provided in Appendix C for Break Apart facts]; scissors; construction paper; flash cards for Clock 5s.) Place the Clock 5 flash cards along the chalk ledge and have students work with a partner select and illustrate two of the facts on grid paper.



Have students cut and glue the rectangles onto construction paper in pairs to illustrate a Clock 5 and its turnaround. Students should label the grids. Verbally emphasize that "When you know one fact [e.g. 4 x 5], you really know two [its turnaround]."

Use the Strategy

- *Super Star!* (Materials: Super Star cards from Appendix C—select just the Clock 5s.) Follow directions given in the Appendix for using this card set. Focus on matching picture or clue, written fact, and answer.

  Variation: As each match is made, one player could be called upon to say or write the turnaround and its answer.

Choose

- *SNAP!* (Materials: Flash cards for Picture 2s, Clock 5s, and turnarounds.) As you flash the cards, students give the answer. If it's a Clock 5 or its turnaround, they snap instead. Immediately call for the answer. From time to time point move the hands of a demonstration model to "match" the fact.

- *Super Star!* (Materials: Super Star cards from Appendix C—select just the Clock 5s and other review facts.) Repeat previous activity, but this time include other review facts as well.

Speed Up

- *Which Is More?* (Materials: Individual chalkboards; flashcards for Clock 5s and other facts previously studied.) Show two cards at a time and have students write, answer, and show you the one with the greater product.

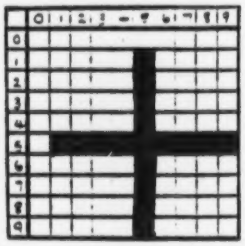
Check Up

FOCUS ON the following facts and their turnarounds:

Appendix A: Jiffy Quizzes: 3x5, ... 9x5
- Fun Quizzes
- Multiplication 1,3

... and other facts previously studied.

When most students have mastered these facts, mark them off the Class Cross Off Chart.



Zeros and Ones

Verbal Prompts: "x0, always 0."
"x1, stays the same."

There are 19 Zeros and 17 Ones facts:

0x0; 1x0, 2x0, ... 9x0 —and their turnarounds.	1x1, 2x1, 3x1,... 9x1 —and their turnarounds.

Look Ahead A clear understanding of the multiplication concept.

Note: Instruction for these special facts would emphasize:

1. Students being able to use objects to illustrate Zero and Ones facts.
2. Students being able to SORT OUT facts which have answers of zero or one from those that do not.

Zeros

Extend to problems like 39 x 0, 0 x 184...

Teach a Strategy * *I Got No Things: That's 0!* --Illustrates 0 x a number. (Materials: Sack of small counters.) As I walk around to each of you, I'm going to take out and give you 2 counters every time I reach into this sack. I want you to keep track of the number of times I reach into the sack and tell me the multiplication sentence for the total number I give you. Then you can count to check.

Appoint a student to keep a board list of multiplication sentences stated by students. Start by reaching in 2 or 6 times, then get to 0 times.

Examples:
Reach in 2 times: 2 x 2 = 4
Reach in 6 times: 6 x 2 = 12
Reach in 0 times: 0 x 2 = 0 (Yes, you got no things—0 in all.)

Repeat the above, this time giving out a different number of counters each time you reach into the sack.

Examples (for giving out 5 each time you reach in):
Reach in 4 times: 4 x 5 = 20
Reach in 6 times: 3 x 5 = 15
Reach in 0 times: 0 x 5 = 0 (Yes, you got no things—0 in all.)

Repeat as necessary to generalize that 0 x *any number* = 0.

Use the Strategy

* *Your Turn to Show.* (Materials: Base 10 blocks or graph paper pieces.) Let students work with a partner to show that:

1 group of 2 tens, or 1 group of 20 = 20.

1 x 20 = 20, but 0 x 20 = 0,

for no groups of 20 leaves an empty work space.

2 groups of 123 is 2 hundreds, 4 tens, 6 ones (246)

2 x 123 = 246, but 0 x 123 = 0,

for no groups of 20 leaves an empty work space, and so on.

Turnarounds

Teach a Strategy

* *No Things in my Pocket—That's 0!* —Illustrates a number x 0. (Materials: Teacher needs to wear or carry clothing with a pocket. This pocket should be empty.) As I walk around to each of you, I'm going to reach into my pocket a number of times out and give you all I have. I want you to keep track of the number of times I reach into my pocket and tell me the multipliication sentence for what I do. Ready?

Appoint a student to keep a board list of multiplication sentences stated by students. Reach 2 or 7 ; 3 or even 0 times! Each time, because your pocket is empty, pull out and give the child an empty handful.

Examples:
Reach in 2 times: 2 x 0 = 0
Reach in 7 times: 7 x 0 = 0
Reach in 3 times: 3 x 0 = 0
Reach in 0 times: 0 x 0 = 0 (Yes, you each got no things—that's a zero total for each of you!)

Lead students to generalize that any number x 0 = 0.

Use the Strategy

* *Your Turn to Show!* (Materials: Base 10 blocks or graph paper pieces.) Let students work with a partner to show that:

2 groups of 42 is 8 tens, 4 ones (84)

2 x 42 = 246, but 2 x 0 = 0,

for 2 groups of 0 just leaves an empty work space.

3 groups of 123 is 3 hundreds, 6 tens, 9 ones (369)

3 x 123 = 369, but 3 x 0 = 0,

for 3 groups of 0 just leaves an empty work space, and so on.

Choose

* *Sort!* (Materials: Cards for Zero facts and other review facts; include addition, subtraction, and multiplication cards involving multi-digit numbers and 0.) Over a period of several days carry out sort activities like the following. When multiplication 1s are taught (see below), integrate flash cards for ones in these activities.

—Have students form a zero with their fingers if the answer is zero, and hold thumbs down otherwise.

—Have students hold thumbs up if the answer is 0; thumbs down otherwise. Occasionally call on a student to give a different problem having 0 as an answer.

—Have students work in small groups to sort the cards into two piles: 1) those with 0 as an answer; and 2) others. This activity could be the focus of an active learning bulletin board or learning station.

In all the above, occasionally have students in some way dramatize or illustrate with counters to check.

Ones

Extend to problems like 1 x 86; 999 x 1...

Teach a Strategy

* *What You Take is All You Get!* —Illustrates 1 x a number. (Materials: Sack of small counters.) As I walk around, I'm going to ask some of you to reach into my sack ONE TIME and take a small handful of counters. I want you to count how many were in the handful and tell the multiplication sentence for how many you have in all.

Appoint a student to keep a board list of multiplication sentences stated by students.

Examples:
2 in the handful: 1 x 2 = 2
5 in the handful: 1 x 5 = 5
3 in the handful: 1 x 3 = 3
Emphasize that "What you take is all you get."

Use the Strategy

* *Your Turn to Show.* (Materials: Base 10 blocks or graph paper pieces.) Let students take turns. Each gets a 1 time chance at drawing a handful of blocks from a bank box of hundreds, tens, and ones. Keep a board list of multiplication sentences that correspond to what is drawn.

Examples:

2 hundreds, 2 tens in the handful: 1 x 220 = 220.
5 tens, 6 ones in the handful: 1 x 56 = 56
3 hundreds, 5 ones in the handful: 1 x 305 = 305
Emphasize that "What you take is all you get."
Get students to generalize that 1 x any number is the number.

Turnarounds

Teach a Strategy

* *So Many Ones!*—Illustrates a number x 1. (Materials: 20 small counters for each pair of students.) Have students take turns giving cubes to their partner. As students work, retain a board list of multiplication sentences that describe how many were given to the partner.

- Pick up a counter and give it to your partner.
  Do it 6 times. *Write: 6 x 1 = 6*

- Pick up a counter and give it to your partner.
  Do it 3 times. *Write: 3 x 1 = 3*

- Pick up a counter and give it to your partner.
  Do it 8 times. *Write: 8 x 1 = 8*

- Pick up a counter and give it to your partner.
  Do it 4 times. *Write: 4 x 1 = 4*

Lead students to generalize that any number x 1 is that number: "x1 stays the same."

Use the Strategy

* *Your Turn to Show!* (Materials: Calculator for each pair of students.) At your cue, let students work with a partner on the calculator to show that any number x 1 is that number.

Example:

Input: 1 (and **1** will appear on the display—like giving your partner **1** counter.)

Input: + (to indicate we wish to repeat this many additional times .)

Input: = (as many additional times as you wish to repeat it.)

The last number on the display is the total number of times you've selected a 1.

Retain a board list of the multiplication sentences that also could be entered to represent this total.

Examples:
Input 1, +, and = (22 times): 23 x 1 = 23.
Input 1, +, and = (6 times): 7 x 1 = 7.

If the constant function on the calculator is too abstract for students, simply let them use counters to verify calculator equations of the form n x 1 = n.

Choose

* *Sort!* (Materials: Cards for Ones facts and other review facts. Include addition, subtraction, and multiplication cards involving multi-digit numbers and 1.) Over a period of several days carry out sort activities like the following.

—Have students hold thumbs up and answer just the facts in which the answer is the same as one of the factors. Each time, after identifying a "Ones" fact, call on a student to say the product aloud. Occasionally call on another student to give a different problem in which the answer "stays the same."

—Have students hold both hands high overhead if the answer "stays the same"; stoop low otherwise. Each time, after identifying a "Ones" fact, call on a student to say the product aloud.

—Have students work in small groups to sort the cards into three piles: 1) those in which the answer "stays the same"; 2) those having 0 as an answer; and 3) others. This activity could be the focus of an active learning bulletin board or learning station.

In all the above, occasionally have students in some way dramatize or illustrate with counters to check.

Speed Up

* *Spotlight Math*. (Materials: Flashlight; flash cards for Zeros, Ones, and other review facts.) Place the flash cards along the chalk ledge and darken the room. Flash the light from card to card as you read them for students to answer.

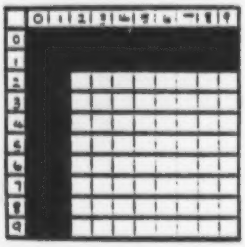
Check Up

FOCUS ON the following facts and their turnarounds:

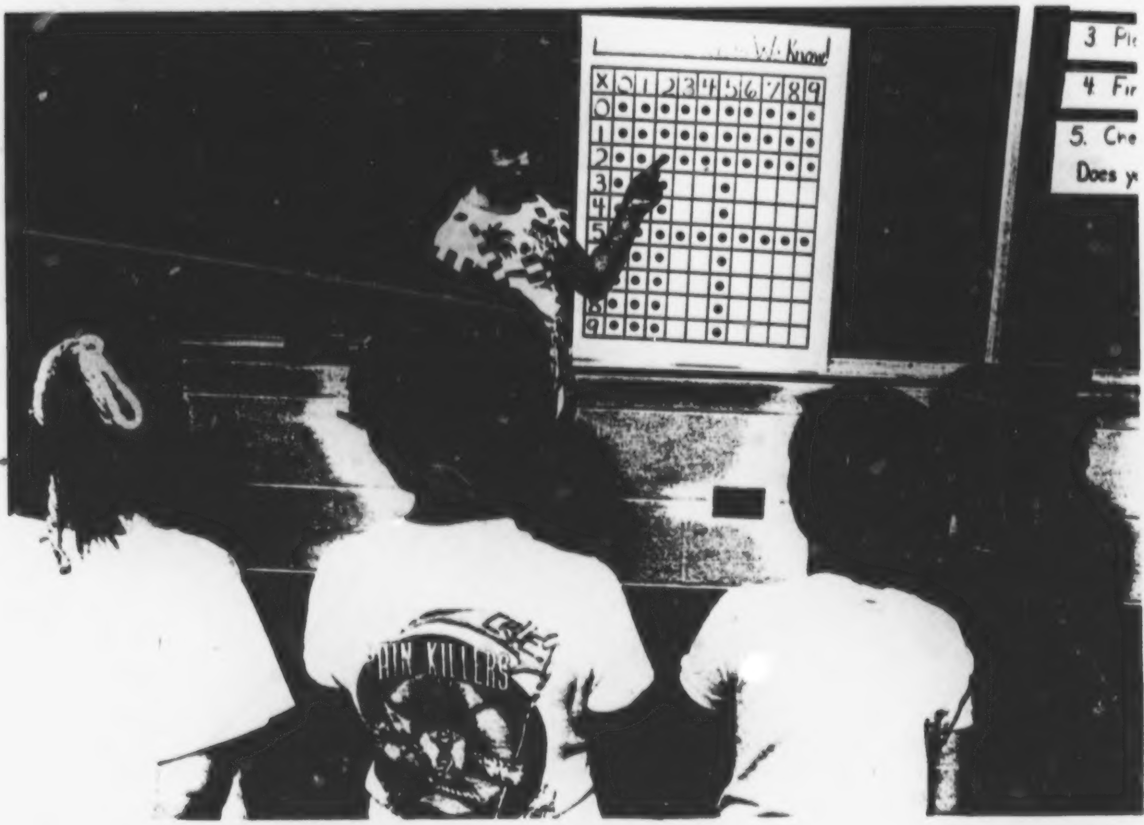
Appendix A: Jiffy Quizzes:
- Fun Quizzes
- Multiplication 1,4,5

0x0, 1x0, 2x0, ... 9x0;
1x1, 2x1, 3x1, ... 9x1

... and other facts previously studied.



When most students have mastered these facts, mark them off the Class Cross Off Chart.



Pattern 9s

Verbal Prompt: "See x9? What's the pattern?"

There are 11 Pattern 9s that have not previously been studied in this sequence:
9 x (3, 4, 7, 8, 9) —and their turnarounds.

Note: Patterning has been called the key to mathematical insight, for the ability to recognize and extend a pattern requires logical thinking, typical of those who succeed in math. There are both number patterns and finger patterns which make learning the multiplication 9s "easy." Exploring one or more of these patterns with students provides an experience in patterning which can open untapped potential or strengthen it. Generally it seems helpful, over time, to expose students to several patterns—and then let them select that which, if needed, personally is most useful.

Some teachers present only one pattern at a time, starting with one they feel the majority of students will be able to use. These teachers feel that presenting too many different patterns in one setting will confuse. Other teachers take a day to play with patterns, and leave the choice entirely to students.

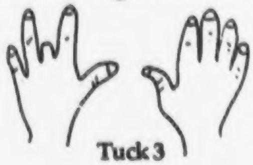
Look Ahead

Depending on which number or finger patterns are presented, it may be necessary to develop or review:

Finger pattern recognition

* *Quick Fingers*. (Materials: Subtraction flash cards.)
Flash fingers to see if students can recognize five fingers (one hand); four (all but one finger on a hand); six (a hand and one extra finger); and other finger patterns to 9. To help, have students use fingers to show answers during subtraction flash card drills. Tell students always to "use up" the fingers on one hand before showing fingers on the other hand. For 12 - 5, for example, students would hold up five fingers on one hand, two fingers on the other.

* *Tuck*. Have students number their fingers, left to right, from 1 to 10. Then have them bend under or press down the finger called: "Tuck 4." "Tuck 6." ...



Tuck 3

The ability to "make 9"

Given one number between 2 and 9, check that students can tell a second which, when added to the first, totals 9.

The ability to subtract a 1-digit number from a multiple of 10

Specifically check whether students can subtract 20-2, 30-3, 40-4, ... 90-9.

Teach a Strategy

* *Number Patterns.* (Materials for the last pattern presented: cubes or counters.)

Help students examine the x9 table for number patterns.

1 x 9 = 9
2 x 9 = 18
3 x 9 = 27
4 x 9 = 36
5 x 9 = 45
6 x 9 = 54
7 x 9 = 63
8 x 9 = 72
9 x 9 = 81

Number patterns many students note include:

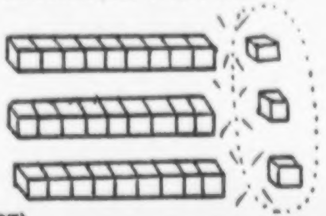
- The counting number sequence appears down the ten's digits in the table, and up the one's digits in the table. (This pattern is interesting, but not very useful for deriving the answer to an unknown x9 fact independent of the table.)
- The ten's digit in each product is 1 less than the number being multiplied by 9.
- The sum of the answer digits is 9.

Together, these last two number patterns are very useful to many students for deriving answers to multiplication 9s they do not know.

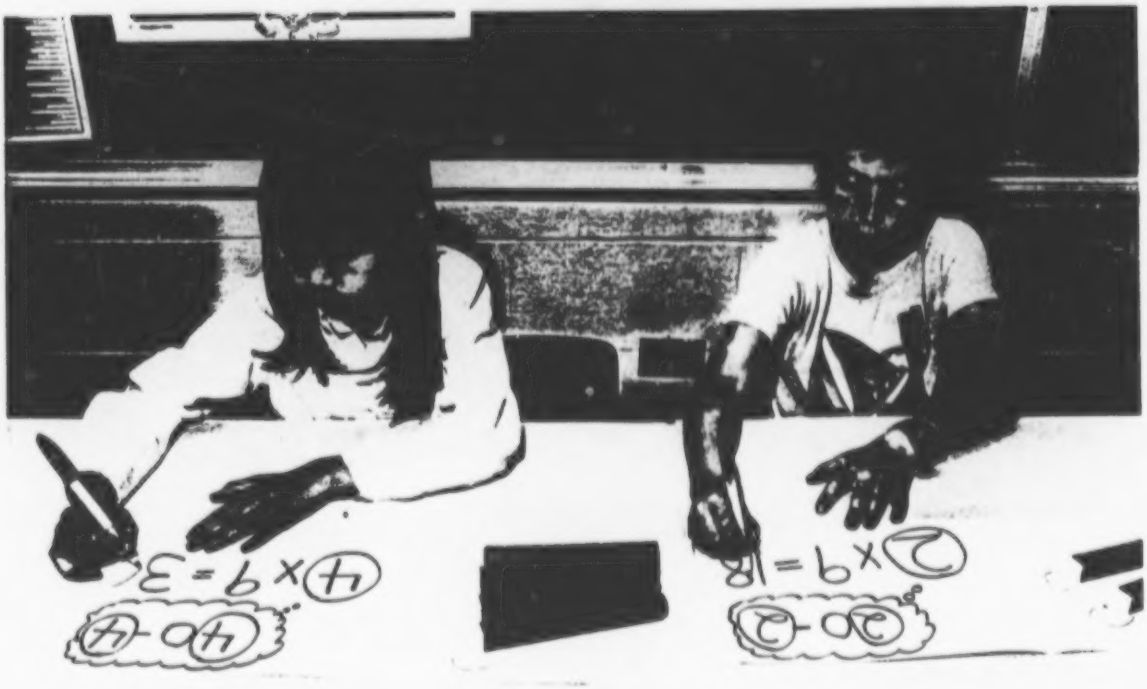
- The fact that 9 x **2** = 20 - **2**;
  9 x **3** = 30 - **3**;
  9 x **4** = 40 - **4**;
  9 x **5** = 50 - **5**;... and so on.

This pattern can be illustrated with cubes.

Example:



3 x 9 = 30 take away 3 (27)



* *Finger Patterns.* Have students number their fingers, left to right, from 1 to 10 as in the Tuck activity at the beginning of this lesson. Then, for 9 x **3** (or **3** x 9), have them bend under or press down the **3**rd finger.

Similarly, for 9 x **4** (or **4** x 9), have them bend under or press down the **4**th finger, and so on.

Use the Strategy

* *Super Star!* (Materials: Super Star cards from Appendix C—select just the Pattern 9s.) Follow directions given in the Appendix for using this card set. Focus on matching the written fact with pattern clue and answer. A colored dot could be placed on certain cards to cue the player who uses the cards in a match to tell how one pattern could be used to derive an answer to a Pattern 9 fact if it were not known.

Variation: As each match is made, one player could be called upon to say or write the turnaround and its answer.

* *Tell My Why.* Present problems with answer options like that below.

9 x 6 = 72, 56, 47, 80, 54, 63.

Call on students to tell which answers DO NOT make sense-- and why. (Students might be expected to refer to a number pattern which does NOT hold in the incorrect products.)

Choose

* *Thumbs Up!* (Materials: Flash cards—Pattern 9s mixed with other known facts. As you flash the cards, students hold thumbs up for Pattern 9s; thumbs down otherwise. For each Pattern 9 identified, call on a student for the answer. From time to time also call on a second student to tell one way the product might be worked out if a student didn't know it right away.

* *2-Minute Roll/Spin* . (Materials: For each team of two students—one piece of school paper and pencil; 1 die or spinner [numbered 2, 2, 9, 9, 9, 9] paper scraps numbers [2, 3, 4, ...,9]). Determine in advance the number of rounds to be played. (For 2 rounds, fold paper in half; for 4 rounds, fold paper in 4ths...)

To start, students fold their paper so only one section of the paper shows. Label it "Round 1." At "Go!" one student draws a number and rolls the die. If a "pattern 9" equation can be formed using the numbers, the student writes both the fact and its answer. After 2 minutes the teacher signals "Stop!" See which team has the most x9s (correctly answered). Review the pattern/approach emphasized. Quickly flash the x9 facts (in order) and give answers so students can check their own work. Do other rounds as time allows. At the end, teammates write their names on their paper and turn it in.

* *Super Star!* (Materials: Super Star cards from Appendix C— select the Pattern 9s and other review facts.) Repeat the previous activity, but this time include other review facts as well.

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Speed Up

* *Over 45?* (Materials: Flash cards for 9s and other known facts.) As cards are shown, students hold thumbs up if the answer is over 45; thumbs down if it's less; and stand up if it's is 45. Then, each time, call on a student to answer: "Good, less than 45, because the answer is…" or "Yes, because 4x9 is…"

Check Up

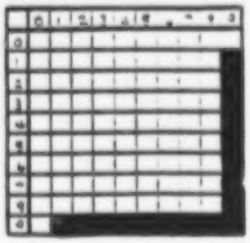
FOCUS ON the following facts and their turnarounds:

Appendix A: Jiffy Quizzes:
- Fun Quizzes
- Multiplication 1,6,7,8

1x9, 2x9, ... 9x9

... and other facts previously studied.

When most students have mastered these facts, mark them off the Class Cross Off Chart.



"Break Apart" Facts

Verbal Prompt: "See a hard fact? Break it into two easy parts."
If it has an even factor: "Do half, then double it."

There are 9 Break Apart facts, including turnarounds::
4 x (4, 7, and possibly 8); 6 x 3; 8 x 3.

Note: Each of these facts *could* be derived by "breaking" the fact in half, and doubling an easier, known fact.

- 4 x 4 is twice as much as 2 x 4 ;
- 4 x 7 is twice as much as 2 x 7;
- 4 x 8 is twice as much as 2 x 8;

- 6 x 3 is twice as much as 3 x 3;
- 8 x 3 is twice as much as 4 x 3.

For individual students, some facts may be derived easier by adding to or subtracting from a known fact. For example:

- 3 x 6 could be found by adding 6 to 2 sixes.
- 4 x 8 could be found by subtracting 8 from 5 eights; or by starting with 9 fours and subtracting 4, as suggested in the One a Week lesson.

The general suggestion is that, when a hard fact is unknown, find some way of breaking the fact into easier parts. If any multiplication fact presented in an earlier lesson is causing students difficulty, discuss ways of breaking it into easier parts.

- 7 x 8, for example, could be broken into 5 eights (40) and 2 more eights (16), or 56 in all.

The Break Apart grid of Appendix C can be used to show the break in an array used to derive a harder fact.

Look Ahead

Check for firm mastery of facts which can be doubled, added to, or subtracted from to derive the harder facts of this lesson.

If a doubling approach is to be encouraged, check whether students can add two 2-digit numbers MENTALLY (e.g. 12+12, 14 + 14, 21 + 21, 16 + 16...) If adding to or subtracting from easier products is to be encouraged, check whether students can make the quick, mental calculations required.

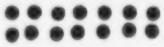
Work to develop the appropriate mental math skills well before this lesson is carried out with students.

Note: Because doubling is the easiest way to break a fact apart, the following activities will focus on developing this technique. Activities can be adapted to help students break facts apart in different ways.

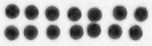
Double an Easy Fact

Teach a Strategy

* *Rub It.* – **Easy Facts to "Unknown" Facts** (Materials: Crayon and paper.) Using a dark crayon, have students draw dots: 2 rows of 7. "How many dots in all?" (2 sevens are 14.) Have students fold the paper to cover the dots--and rub hard with a finger nail. "When you unfold, how many will you see?" (4 sevens--14 and 14 = 28.) Label as shown:



2 x 7 = 14

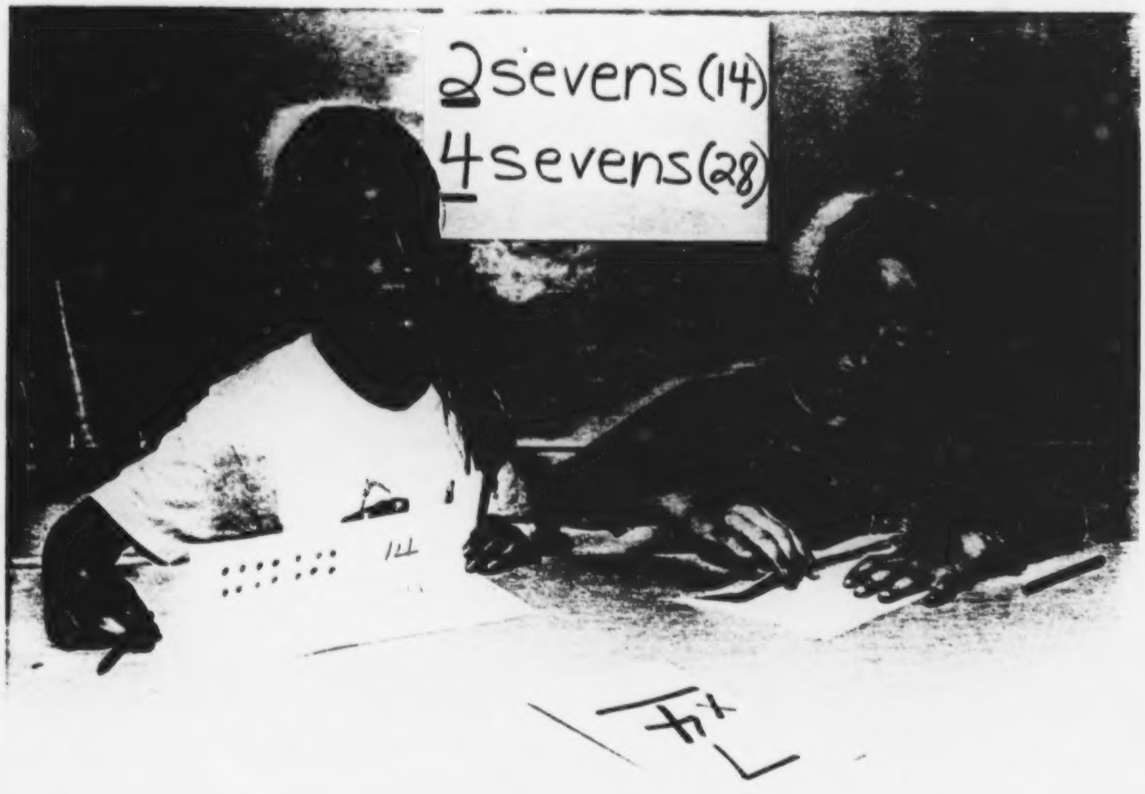


so

2 x 7 = 14
4 x 7 = 28

Repeat for other unknown facts which can be derived by doubling easier, known facts. Make a bulletin board of the drawings. Label the display: "Break Apart Facts."

Note: Be sure students know a fact well before you ask them to double it to form another.



* *Doubling*.—**"Unknown" Facts to Easy Facts** (Materials: Bulletin board drawings from *Rub It* or the Break Apart grid paper from Appendix C.) Distribute the drawings and have students work with a partner to:

- Write the fact for each drawing (e.g. 4 x 7 = ___);
- Fold the paper in half and write the easy "helper" (e.g. 2 x 7 = 14);
- Mentally double the easy fact and give the answer to the harder fact. "Many harder facts are twice as much as some fact you already know. Look for one even factor. Then take half and double the easy fact."

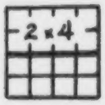
Think
What helps?
7
x4
7
x2

* *Do the Easy Part*. (Break Apart Facts grid from Appendix C; crayon; flash cards for Break Apart Facts.) Place flash cards for the Break Apart Facts along the chalk ledge or write them on the board. Have students take turns with a partner.

One student selects and copies a Break Apart Fact. The partner tells the product if it is known. The partner uses the Break Apart grid to check (or, if the answer is not known, to derive) the fact selected.

The way one pair of students did this:

One student selected 4 x 4. The other drew a 4 x 4 array, cut it in half, and labeled it as shown. This student told the other: "2 fours are 8, so 4 fours are twice as much, 16."



$$\begin{array}{r}8\\+8\\\hline 16\end{array}$$

Use the Strategy

* *Match and Write.* (Materials: Flash cards for the Break Apart Facts and for the easy "helper" facts used to derive them.) Place flash cards for the "helper" facts along the chalk ledge. Distribute the Break Apart Fact cards to students.

Have students match each Break Apart Fact to its "easy" helper. At their desks, students should write (and answer) both the helper and the Break Apart Fact each time a match is made. Summarize by collecting and flashing the Break Apart Facts. Provide reinforcing feedback as needed: ..."Yes, 2 sevens are 14, so 4 sevens are 28."... From time to time call on a student to identify the bulletin board picture (from *Rub It*) to check.

* *Double Decker*. (Materials: Flashcards; tape; chalkboard.) Tape each Break Apart Fact on the wall (top edge only), its easy "helper" underneath. As students go in and out of the room, point to a fact to be answered. As needed, allow students to lift and see the "helper" fact hint.

Choose

* *Picture Check*. (Materials: Flash cards; individual chalkboards.) Students only write and show answers for Break Apart Facts. From time to time call on a student to identify the bulletin board picture (from *Rub It*) to check.

Speed Up

* *Beat the Buzz.* (Materials: Flash cards and timer.) Set the timer and see how many facts can be answered before the timer buzzes. Repeat to better this record.

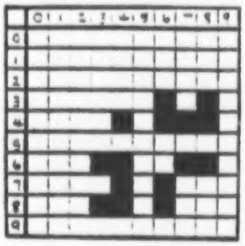
Check Up

FOCUS ON the following facts:

Appendix A: Jiffy Quizzes:
- Fun Quizzes
- Multiplication 1; 9-12

4 x (4, 7, 8); 6 x 3; 8 x 3,

... and other facts previously studied.



When most students have mastered these facts, mark them off the Class Cross Off Chart.

Squares and the "Miner Fact"

Verbal Prompt: "One last fact is surely fine; 7x7 is 49."

One Last Fact: 7x7 (the "gold miner fact").

Facts to be reviewed: Other squares: 2x2, 3x3, 4x4, ... 9x9.

Look Ahead

- Clear understanding of the multiplication concept.
- Ask the school's music teacher to teach Clementine ("...Dwelt a miner, 49er...") ...*Suggestion from Linda Pauk.*

Teach a Strategy

* *Strike It Rich!* Ask students what they think of when you say "49ers"—besides a ball team. If they don't respond, say, "The Gold Rush (1849)--during which the miners took a pick (draw a 7 on the board) and a spare (draw another 7). We'll let these 7s be gold picks to remind us: 7 x 7 = 49. This is the "miner" fact.

* *Last Fact*. "One last fact is surely fine, 7 x 7 is 49!" Given that the preceding sequence has been followed, point out to students using the Class Cross Out Chart that this is the last of the 100 basic multiplication facts to be learned.

Use the Strategy

* *Squares*. (Materials: Break Apart Facts Grid from Appendix C; crayons.) Ask students to use a golden crayon to draw a 7 x 7 shape (square) on the grid. "One last fact is surely fine, 7x7 is 49." Point out that, because of its shape, 7 x 7 [49] is called a square number, or perfect square. Ask students to "draw" and label other squares (to 9 x 9 [81]). They should write the related multiplication fact under each.

Variation: Project a graph paper grid onto the chalkboard (using overhead projector), and let students use colored chalk to draw the squares and label them, as above. Alternately, the squares could be drawn onto colorful paper for a bulletin board or hall display. Put the 7x7= 49 square on gold paper. "One last fact is surely fine; 7x7 is 49."

Choose

* *Pop Up!* (Materials: Multiplication flash cards; individual chalkboards.) Students "pop up" like toast (stand) to answer 7x7 and other squares every time they appear. They

otherwise write and show answers written. Let the 7x7 fact "come up" more often than other facts. "Yes, that's the miner fact... One last fact is surely fine; 7x7 is 49."

* *Square It*. (Materials: Multiplication flash cards; individual chalkboards.) Flash the cards, letting the squares come up more often than others. Students WRITE and SHOW each answer on their slates. If the fact is a square number, students should draw a square around the answer on their slates before showing it. If it's the miner fact, all could stand a sing the "Dwelt a miner, '49er" phrase from Clementine; OR students could be directed instead to draw a gold pick by its answer on their slates.

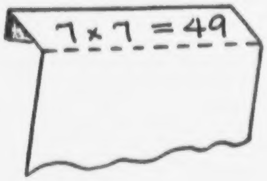
Use the Strategy

* *Super Star!* (Materials: Super Star cards from Appendix C—be sure to include the Gold Miner Fact.) Follow directions given in the Appendix for using this card set. Focus on matching picture or clue, written fact, and answer.

Speed Up

- *Gold Miner Sheet*. (Materials: Paper and pencil.) Ask students to write the gold miner fact at the top of a sheet of paper. Ask them to finger trace over the fact as they say it to themselves. Then have them close their eyes and write the fact in the air, on the chalkboard of their minds.

  Eyes open, have students fold the top line (pleat the paper) to hide the fact before writing it again. Repeat the folding and writing to the bottom of the sheet. Students can open to check any time. At the end, when the paper is unpleated, every line should be "like" the top line. Team captains could count "winners" as they finish.



  Note: Use this technique for repetitious practice of troublesome number facts or spelling words. Each new line must be recreated rather than mindlessly copied.

- *Star Shoot*. (Materials: Multiplication flash cards; individual chalkboards.) These flashcards will be our shooting stars today. After I say each fact, I'll let it shoot into space. Before it touches this desk (identify a student's desk near you), try to WRITE and SHOW the answer. Ready? *Say each fact, pause 2 seconds, then drop the card onto the student's desk. When it makes contact, give the answer. Let squares , especially 7 x 7, appear quite frequently. Repeat in quick succession to form a "display" of shooting stars.*

- *Sea World*. — Speed Up game for 2-3 players. (Materials: Sea World game path and chance cards from Appendix C; game marker for each player.) Follow the directions in Appendix C for using the game path.

* * *

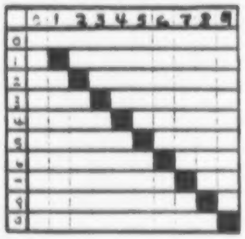
- *Let's Party!* (Materials: Snack wrapped in gold foil; the pleated sheet from the previous activity.) Trade students a bit of gold (snack in gold foil) for their correctly completed "gold miner" sheet. "Since we now know all the multiplication facts, let's party!" There is even a party song: Clementine!

Check Up FOCUS ON the following facts:

Appendix A: Jiffy Quizzes:
- Fun Quizzes
- Multiplication 1; 13-14

7 x 7 and other squares:
(2 x 2, 3 x 3, 4 x 4; ... 9 x 9);

... and other facts previously studied.



When most students have mastered these facts, mark them off the Class Cross Off Chart.

Division:

Sample Lessons

- Picture 2s
- Clock 5s
- Zeros and Ones
- Pattern 9s
- Multiply to Help Facts

Instructional Strategies for Helping Students Memorize Division Facts

Five sample division lessons, each based on the six-step instructional framework proposed earlier in this resource, are listed on the previous page. For most students, teaching the facts in the sequence suggested by this list has proved most useful. The list of lessons, named by the strategy most often used to derive unknown facts in the lesson, can be partitioned into easy facts; special facts: Zeros and Ones; and harder facts.

Teaching EASY Facts — ÷2s (Picture 2s), ÷5s (Clock 5s),
÷9s (Pattern 9s)

For each set of these easy facts:

- Check the prerequisites listed in the sample lesson.
- Carry out the following FIVE Basic Steps—usually over a period of several days. Specific ideas for doing so are contained in the sample lessons which follow.

1. **Teach a way to work out answers fast.** Start "hands on," as suggested in the sample lessons.
   "See a 2? What's the picture?"
   "See a 5? Think minutes after. Where's the minute hand?"
   "See a 9? What's the pattern?"

2. **Multiply to check.** Carry out explicit activities which reinforce the division-multiplication relationship. Start "hands on," using cubes or counters as suggested in the sample lessons, then follow with written exercises to illustrate and emphasize, for example: 14 ÷ 2 = 7 because 2 x 7 =14.

3. **Teach the related partner facts.** For example, when Clock 5 facts are firmly mastered, suggest that students use them to help learn unknown, related division facts. 35 ÷ 5 = 7, so 35 ÷ 7 = 5. "Hands on" and other activities and exercises are useful in this teaching, as suggested in the sample lessons.

4. **Study fact families.** The sample lessons engage students using cubes or counters, finger flash cards, and other activities and written exercises to consolidate retention of known facts in families like: $5 \times 7 = 35$; $7 \times 5 = 35$; $35 \div 5 = 7$; $35 \div 7 = 5$.

5. **Provide additional drill** in the form of short activities and written exercises. On-going, systematic drill and practice typically is necessary to assure retention of newly learned division facts in long term memory.

Teaching SPECIAL Facts: Those with 0 or 1 as a factor.

Use small objects to illustrate meanings. Carry out sorts (e.g., those whose answer is 0 (or 1) versus those whose answer is not...). Activities of this type are contained in the sample lessons for Zeros and Ones.

Teaching Unknown "HARDER" Facts.

For these facts:

- Check the major prerequisites, which are:
  —mastery of related multiplication facts; and
  —previous experience (with easy division facts) emphasizing multiply to check activity.

- Carry out the following FOUR Basic Steps—usually over a period of several days. Specific ideas for doing so are contained in the sample lessons which follow. Many teachers start with perfect squares: $36 \div 6$; $64 \div 8$. . . .

  For each set of "harder" division facts studied:

1. **Encourage students to use multiplication facts they know to answer unknown division facts.**

2. **Teach related partner facts.** Squares, of course, and facts having a dividend of 0 have no related partner facts.

3. **Study fact families.** Note that squares and zeros have "small" families.

4. **Provide additional drill.**

Suggestions for implementing these four steps during division instruction are contained in the sample lessons which follow.

Picture 2s

Verbal Prompt: "See ÷2? Think of the picture."

There are 15 Picture 2s: 4÷2, 6÷2, 8÷2, ... 18÷2,
— and their partner facts: 6÷3; 8÷4, … 18÷9.

Look Ahead Check for:

- A clear understanding of the division concept.
- Firm mastery of x2s and their turnarounds.

Teach a Strategy Because most students know multiplication 2s, the ÷2 facts tend to be very easy. Use pictures to help students learn any of these facts they do not know. Use the following ideas as needed.

Link Picture to Written Fact

* *Do You See It?* (Materials: Cards for Picture 2s, Appendix C.) Use the picture cards only for division 2s which students do not know. Use the cards to help students "see," for example, that 14 ÷ 2 can be thought of as: 14 days, divided into 2 weeks—7 days in each week. It's the 2-week fact. Or, for 16 ÷ 2 is the crayon fact: 16 crayons, divided into 2 rows—8 crayons in each row.

Continue in a similar manner for each unknown fact. Each time, have students write the division fact being illustrated. Verbally emphasize: "See ÷2? Think of the picture."

Link Written Fact to Picture

- *Division Pictures.* (Materials: Cards for Picture 2s, Appendix C; flash cards for ÷2 facts.) Place the Picture 2 cards along the chalk ledge (random order). Distribute flash cards to students. In turn, have students read and answer the fact given them, then place the card on the chalk ledge beside the related picture. When all cards are placed, place each fact card over its picture and have students help reorder the cards, low to high, by quotient. If it seems helpful, retain the cards (with picture hints underneath) in a bulletin board or wall display.

Use the Strategy

- *Your Turn.* (Materials: Individual chalkboards; cards for Picture 2s, Appendix C.) Direct students to write the even numbers from 4 through 18 at the top of their slates. Students take turns calling out one of these numbers, and others write and answer the ÷2 fact using the number as the dividend.

  When students show their work, occasionally have students match to the related picture or provide feedback like: "Yes, 14÷2=7. That's the 2-week fact: 14 days, 2 weeks—7 days in each week." Create a tally system for correct answers, if you like, and set up teams: girls vs boys; rows or groups against each other, and so on.

Choose

- *Got the Picture?* (Materials: Cards for Picture 2s, Appendix C; flash cards for ÷2 facts and other facts not yet studied this year.) Distribute the cards to students. Say, "Who has the ... 2-week fact?" (...fingers fact? ... crayon fact? ...) Each time, students who have the fact requested should stand, read and answer the fact, then trade cards with someone who is sitting. If it seems helpful, show and discuss the picture clue.

Speed Up

- *On the Draw.* (Materials: Individual chalkboards; flash cards for ÷2 facts.) Draw a sample stickperson on the chalkboard: head, neck, body, 2 arms, 10 fingers, 2 legs, 2 shoes.
  As you flash the cards, students try to answer and show their work before you give the quotient. For each correct answer, students draw one part of the stickperson on a corner of their board. See who finishes first!

Multiply to Check

Verbal prompt: "When you know multiplication, you know division, too."

Clearly, the most efficient way to answer UNKNOWN division facts is to use known multiplication facts to provide the answer.

Example: I know $12 \div 2 = 6$ because $2 \times 6 = 12$.

Some children cannot use multiplication facts to derive division fact answers simply because the related multiplication facts are not memorized. This is the underlying reason for the suggestion to delay the introduction of a group of division facts until the related multiplication facts are mastered. To move directly from multiplication 2s to division 2s with beginners or slower students typically does not allow adequate time to develop the mastery needed for using multiplication to answer or check related division facts.

Some developmentally immature students find it difficult to "think multiplication" when given a division problem. Indeed, for these children, there may be a time lag between recognizing the multiplication-division relationship and being able to *use* it answer unknown division facts. This belief has prompted the careful cultivation in this teaching resource of strategies involving pictures, clock times, and patterns to help answer "easy" division facts. The idea is to allow time gradually to build the multiplication-division relationship and its use is through "Multiply to Check" activities such as those presented below.

Look Ahead Check for mastery of related multiplication facts.

Teach a Strategy • *Share Out and Check.* (Materials: Cubes.) Taking turns, one student talks through the ÷2 example you write on the board while others use cubes to illustrate the division.

"Share 12 cubes among 2 students. Each gets 6."

Then instruct students to push the cubes back together:

"Multiply to check. $12 \div 2 = 6$ because $2 \times 6 = 12$."

Have students write division fact and its "multiply to check" fact. Repeat for other ÷2 examples.

Use the Strategy • *I Can Show You!* (Materials: Page of division facts; Cards for Picture 2s, Appendix C; two or three pieces of string, each about 8" long.) Suggest that students select one or two favorite problems on the page and do these first. Beside each, they should write the "Multiply to Check" fact. Move among students. Give one student the picture card related to one fact circled. While that student sets up the problem by using string to divide the picture into 2 parts, give a second student a different picture and string for the same task.

Return to the first student so the child can illustrate and verbalize for you both the division and its multiply to check fact. To illustrate, students would place the string on the picture as they state and show the division fact, and then remove it as they state the "Multiply to Check" fact.

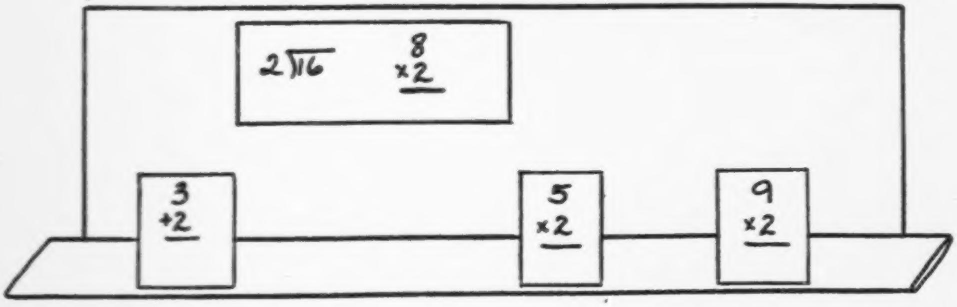
Comment, "Yes, the answer is in the multiplication fact. Your division checks." Collect the picture and string for reuse, and repeat listening to children's individual explanations as long as time allows. It will be possible to get to most students in one or two class periods. Be sure to involve slower students who most need to verbalize and illustrate their thinking.

Question teachers ask:
Does it matter, for 18 ÷ 2, whether students give 2 x 9 or 9 x 2 as the Multiply to Check fact? Some may formally argue that one is more correct than the other, but it is rather "splitting hairs" to require this technicality of students just now. The students who provides either fact should be applauded that they are able to make the link to multiplication!

Choose

* *Find It, Write It.* (Materials: Flash cards for division 2s and related multiplication facts.) Coming in from lunch or gym, or ..., children pick up a division fact from a box near the door and try to locate the "Multiply to Check" fact along the chalk ledge.

2)12
2)10
2)14
Multiply to Check



Students copy the division and its "Multiply to Check" fact onto the chalkboard, then draw a box around it. Students return the flash cards to the boxes on the teacher's desk (multiplication in one box, division in another). They then return to their seats, copy, and complete as many of the problems written on the board as is possible in the time you allow.

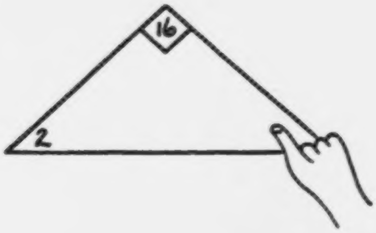
When you decide time is up, quickly write answers to the board problems so students can check their work. Talk out loud and involve the children. "Yes, 14 ÷ 2 = (7) because 2 x **7** = 14." Collect papers or simply ask: "How many correctly completed at least 3 matches? 5? Did anyone manage all 8?... Good!"

Speed Up

- *What's on the Back?* (Materials: Multiplication/Division flash cards for ÷2 facts, Appendix C; individual chalkboards.) As you show the division side of each card, students write and show the answer and the "Multiply to check" fact. Show the flip side of the card to check. .

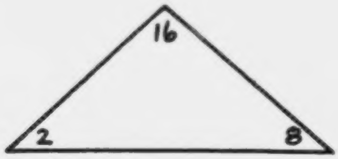
- *Two Will Do* . (Materials: Finger Flash Cards, Appendix C.) Students take turns with a partner. One student hides the answer until the other writes the complete division and related Multiply to Check facts. The child then lifts the finger to check: to write a division fact and its "Multiply to Check" fact.)

Example:



"Yes,

16 ÷ 2 = 8



because 2 x **8** = 16

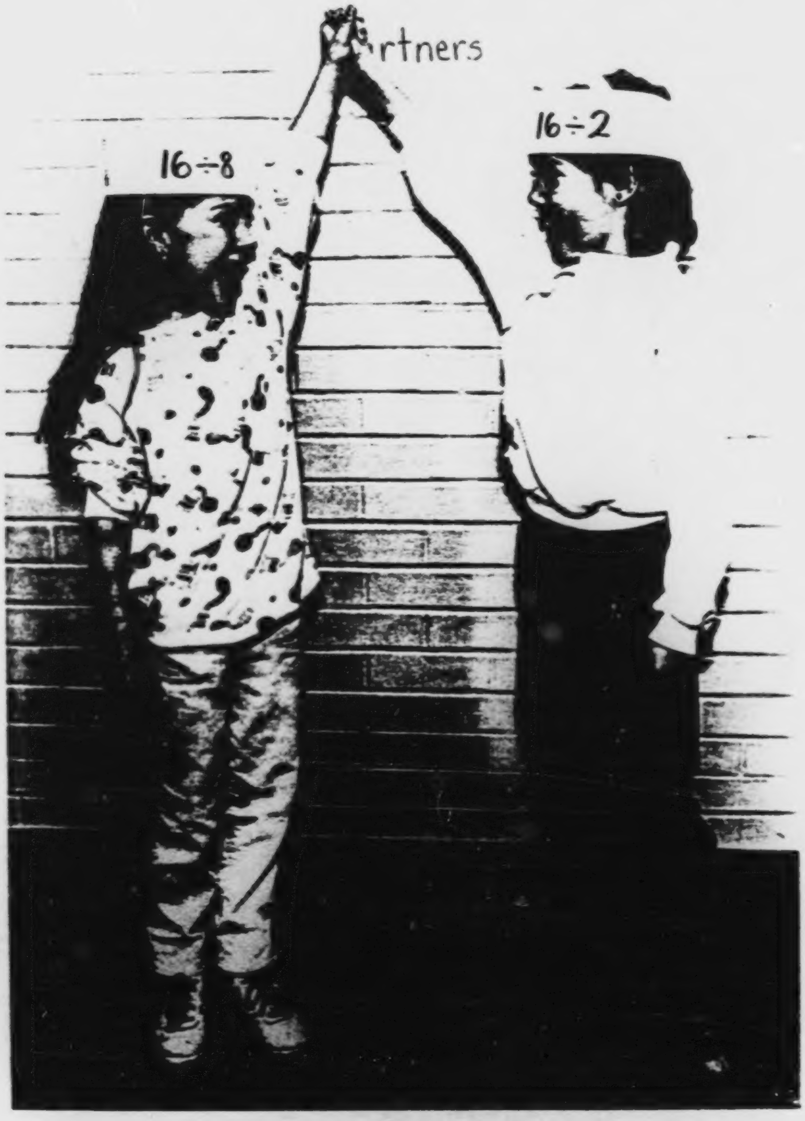
- *Multiply to See.* (Materials: Completed sheet of division facts.) Students take turns with a partner. One student places a finger over the dividend of a completed problem. After the other multiplies the divisor and quotient (orally), the student lifts the finger to check that the product given is the dividend.

Division Partner Facts

Verbal prompt: "Same whole, same factors: good partners."

It will prove helpful to students in the long run if you take the time also to focus on related division facts. We call them partner facts. These are facts that have the same *whole* (dividend) and the same *factors* .

Examples: 10 ÷ 2 = 5 and 10 ÷ 5 = 2;
14 ÷ 2 = 7 and 14 ÷ 7 = 2.



Activities to Build the "Partner" Relationship for Division 2s

Look Ahead Firm mastery of division 2s before relating to other division facts.

Teach a Strategy

- *Break Up.* (Materials: 18 unifix cubes or other counters; one chalkboard for each pair of students.) This is a good circle activity. Students work with a partner in the circle. One writes the division problem you dictate on the slates (e.g. 12 ÷ 2). the other makes a long unifix train for the dividend (12). Ask students to write the number each will get if they share the cubes (6, for 12 ÷ 2 = 6. Break the train into two equal parts and count to check.)

  Now have students make the 12 train again and share among six. Without erasing, have students write a second fact to match this action. (12 ÷ 6 = 2) "Yes, 12 ÷ 2 = 6 and 12 ÷ 6 = 2. These two facts have the same *whole* (12). Circle the 12 in each problem on your slate. These two facts have the same *factors* (2 and 6). We call them partner facts." Repeat with other facts.

Use the Strategy

- *WRITE and SHOW.* (Materials: Individual chalkboards, unifix cubes; flash cards for ÷2 facts.) As cards are flashed, students answer in unison, then write and show on their chalkboards the partner fact for each. From time to time, pause and have students use unifix cubes to show that they have written is correct. Verbally emphasize: "Same whole, same factors: good partners."

- *Side by Side.* (Materials: Page of division facts.) Suggest that students circle three favorite problems on a page and do those first. Beside each, they should write the partner fact. Move among students. Give one student enough cubes to illustrate one division fact circled. While that students sets up the problem, give a second student enough cubes for the same task.

  Return to the first student so the child can illustrate and verbalize for you both the division and its partner fact. For example, 10 ÷ 2 = 5 and 10 ÷ 5 = 2. Verbally emphasize: "Same whole, same factors: good partners." Give this student's cubes to another student and repeat listening to children's individual explanations as long as time allows.

Choose

* *Find Your Partner*. (Materials: Flash cards for ÷2 facts and their partner facts.) Give each student a basic fact card for division. Each student finds the person holding the partner card. Then students write the two facts aside each other on the board (without answers) for others to copy and complete.

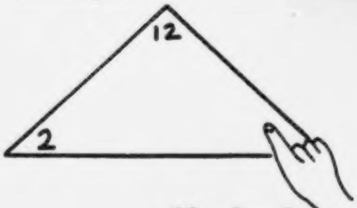
* *Find It, Write It*. Adapt the Multiply to Check *Find It, Write It* activity above. Have students locate, write, and box partner facts.

Speed Up

* *Two Will Do* . (Materials: Finger Flash Cards, Appendix C; individual chalkboard for each pair of students.) Students take turns with a partner. One student hides the answer until the other writes and completes both the division and its related partner fact. Lift the finger to check.

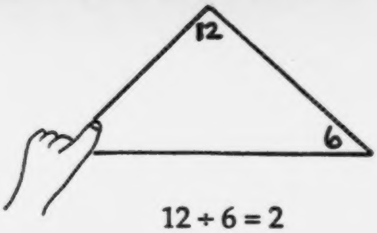
Partner Facts
14÷2
14÷7=

Example:



12 ÷ 2 = 6

and



12 ÷ 6 = 2

- *We Agree!* (Materials: Individual chalkboards; flash cards for ÷2 facts.) Students team with a partner. As you flash each ÷2 fact, students write the answer and its division partner fact. Students then compare boards with their partner. If they agree, they SHOW their slates.

Families of Division Facts

Verbal Prompt: "To know one is to know all in the family."

The ability to recognize and use relationships between number facts has valuable applications and extensions to mental mathematics and estimation. Forming families of facts provides experiences in relating numbers in useful ways that enhance this ability.

18
9
2
9
×2
2)18
9)18

Most fact families consist of four facts, two multiplication facts (turnarounds) and two division facts (partners) which involve the same triple of numbers: the whole and its two factors.

Sample Family of facts: $16 \div 2 = 8$, $2 \times 8 = 16$,
$16 \div 8 = 2$, $8 \times 2 = 16$

Note: As students later deal with Zeros and Perfect Squares, they should be led to conclude that these sets of facts have "small" families.

Example for Zeros: $0 \div 6 = 6$, $0 \times 6 = 0$, $6 \times 0 = 0$

Example for Perfect Squares: $25 \div 5 = 5$, $5 \times 5 = 25$

Activities like the following structure the study of fact families in the number fact program. These activities consolidate learning and promote retention.

Look Ahead Mastery of the addition and subtraction facts involved in the fact families to be identified or formed.

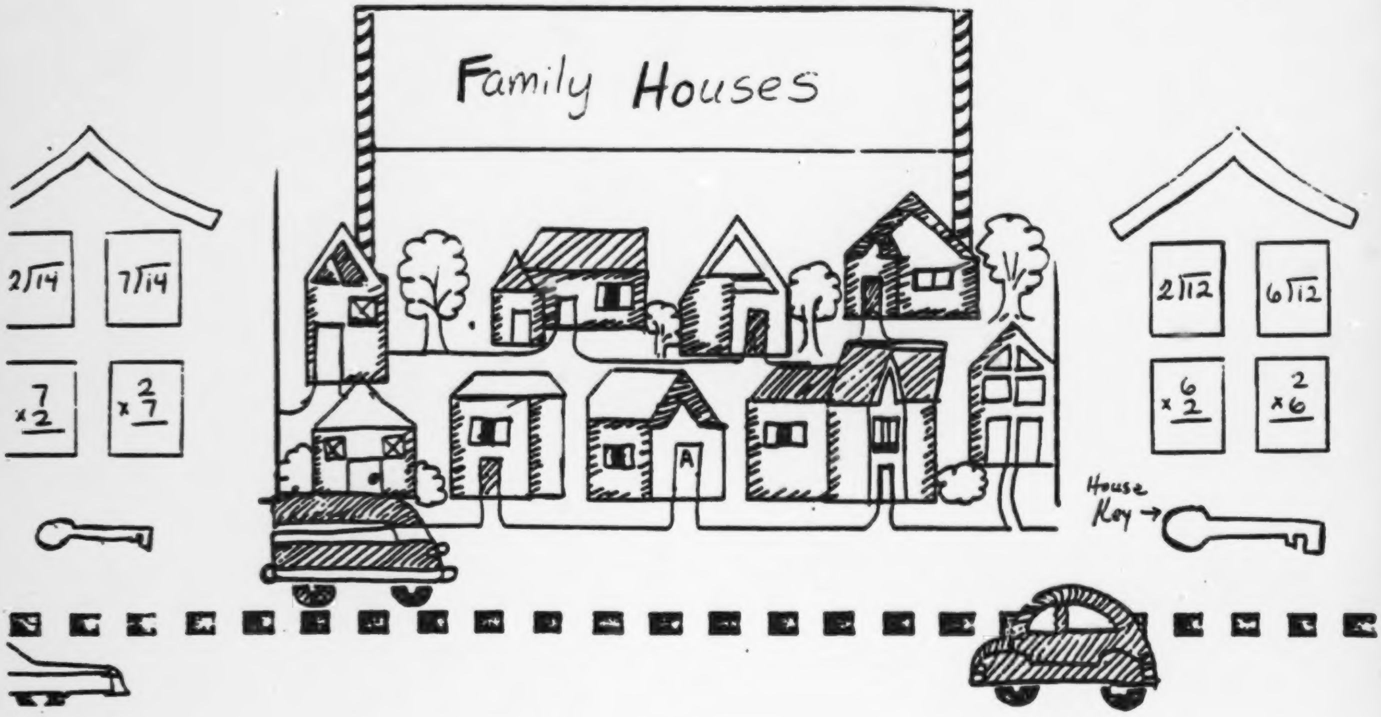
Teach a Strategy

- *To Know One is To Know All.* (Materials: Chips or other small counters.) Lay chips in rows to form a rectangular array. Move the rows apart/together, to illustrate all the facts in one family. Verbally emphasize: "To know one is to know all in the family."

Use the Strategy

- *Family Houses.* (Materials: Division flash cards for Picture 2s and their partner facts; cards for the related multiplication facts; construction paper keys [one for each family of facts]; 9" x 1" construction paper strips [two for each family of facts]; chips or other small counters.) Students work with a partner. Together they sort the facts by family, as shown, then use rectangular arrays of chips to check. If all is in order, the house is "sold." That is, the roof (two 9" x 1" paper strips) is put in place and the house key is put in the front door.

  Variation: Teachers can have students write or tell the answer to each fact before "selling" the houses.



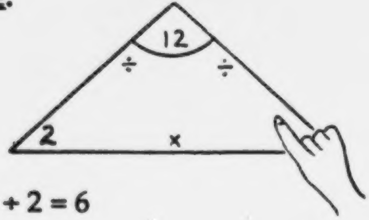
* *Pass the Bucket*. (Materials: Division flash cards; individual chalkboards, bucket or box of counters. As each fact is flashed, students WRITE and SHOW other facts in the same family. From time to time, "pass the bucket" or box of counters to a student to validate what has been written. (The student would form the appropriate rectangular array on a sheet of paper, and move rows together/apart or turn the array 90° to represent the facts in the family.

Choose * *Join Your Family*. (Materials: Flash cards for facts in the same family as ÷2 facts.) Distribute the cards to students. Each child tries to find students holding other facts in the same family as that written on the card held. As all cards for a family are found, students write the four facts aside each other on the board (without answers) for others to copy and complete. Verbally emphasize: "To know one is to know all in the family."

Speed Up

* *Write It All.* (Materials: Finger Flash Cards, Appendix C; individual chalkboard for each pair of students.) Students take turns with a partner. One student hides the answer until the other writes and completes one fact in the family using numbers on the card. Lift the finger to check. Then repeat until all facts in the family are written.

Example:



12 ÷ 2 = 6

Repeat in a similar manner for 12 ÷ 6=2, 2 x 6=12 and 6 x 2=12.

* *Tell What's Missing.* (Materials: Cards with division facts, individual chalkboards.) For each card flashed, students write on their slates other facts in the same family. They compare slates with a partner and, if they agree, show the facts they have written.

Check Up

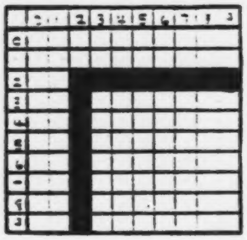
FOCUS ON the following facts:

Appendix A: Jiffy Quizzes:
- Division 1-2

4÷2, 6÷2, 8÷2, ... 18÷2; their partners: 6÷3, 8÷4,...18÷9

... and other facts previously studied.

When most students have mastered these facts, mark them off the Class Cross Off Chart.



Clock 5s

Verbal Prompt: "See ÷5? Think minutes after."

There are 13 Clock 5s not previously treated in this sequence: 15÷5, 20÷5, ... 45÷5;
—and their partners: 15÷3, 20÷4, ... 45÷9.

Look Ahead Check for:

- Firm mastery of x5s and their turnarounds.
- Ability to tell time on the clock quickly to the nearest five minutes.

If students can tell time on the clock to the nearest five minutes, the ÷ 5 facts can be very easy. They can use clock times they know to help.

Teach a Strategy

* *The Clock Helps.* (Materials: Demonstration Clock.) Given a Clock 5 in division, students say the "minutes after" and move the hand of a demonstration clock to the answer digit.

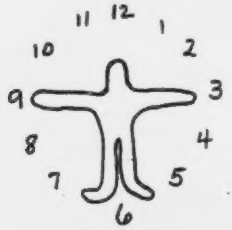
5)20
5)15
5)35
5)40
5)45
Clock 5s

Use the Strategy

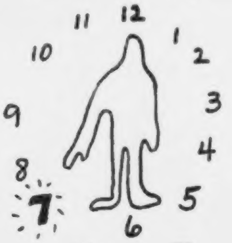
* *Clock It*. (Materials: Clock and individual slate boards for each team of two students; ÷5 flash cards.) Let students work with a partner. As you show each division card, one student sets the clock to match the fact, the other copies and answers the fact on the chalkboard. Reinforce frequently by saying: "You see ÷5—think minutes after. Where's the minute hand?—Yes, on the answer digit." Students trade roles each time.

Choose

* *Show the Minute Hand*. (Materials: ÷5 flash cards mixed with other division review facts.) As you flash each card, students answer (in unison) if it is a review fact; stand on Clock 5s and point an arm to the answer digit of their "body clock."



Body Clock



35 ÷ 5 = 7

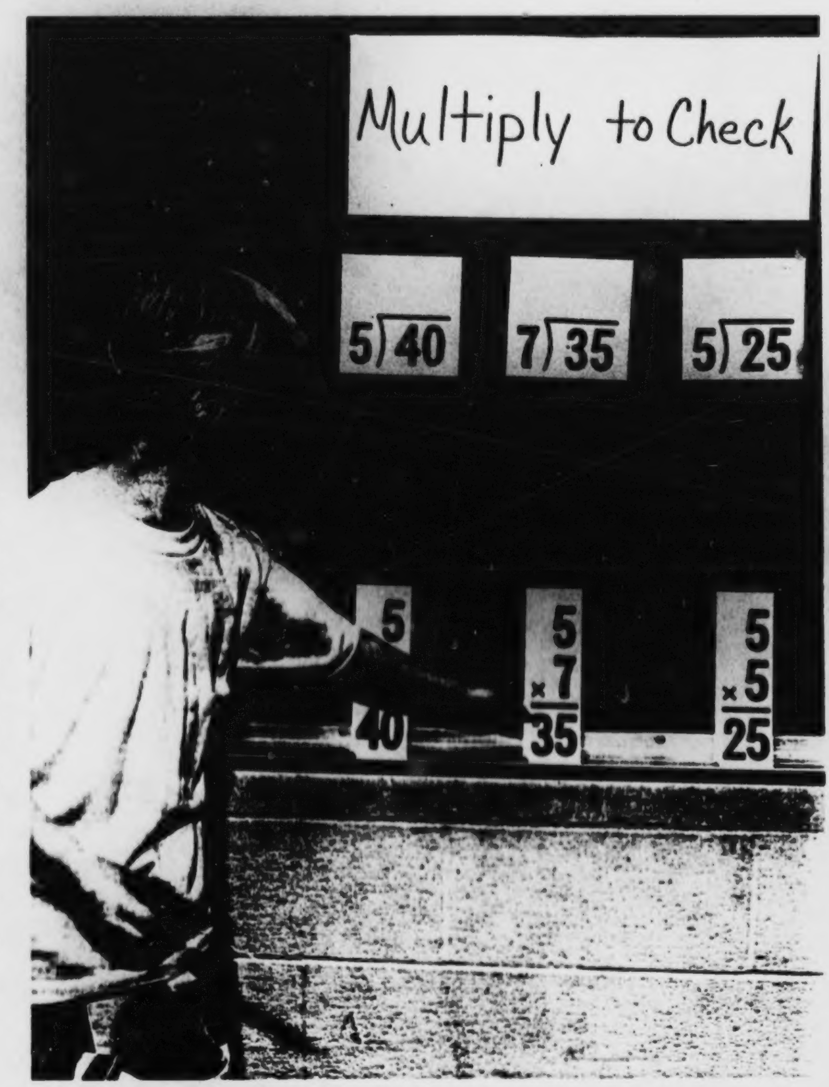
After students stand on Clock 5s, immediately point to one student to tell the answer.

Speed Up * *Right On!* (Materials: Flash cards for ÷5 and other known facts.) As you flash the cards students hold thumbs up if the answer is greater than 5, thumbs down if its less, and stand if it's "right on" 5. When students hold thumbs up/down, call on an individual to tell the answer. "Yes, greater than 5 because the answer is..."

Multiply to Check

Help students develop a good sense of the division-multiplication relationship through activities like the following and others on pp. 89-91. **Emphasize:** "When you know multiplication, you know division, too."

* *No! Can't Be!* (Materials: Envelope of answer cards: 2, 3, ... 9; Clock 5 cards from Appendix C.) Place each Clock 5 picture and matching multiplication fact card side by side on the chalk ledge. Appoint one student to hold the envelope of answer cards. Write a ÷5 fact on the board (e.g. 40 ÷ 5) and have a student draw an answer digit card from the envelope (e.g., 6). "Is 40 ÷ 5 = 6?" Children hold thumbs up if the answer drawn is correct. Otherwise, as in this case, they say (in unison), "No! Can't Be!" Immediately say "40 ÷ 5 cannot be 6 because 5 x 6 is not 40. 40 ÷ 5 must be ..." (call on a student: "...8, because 5 x 8 = 40.")



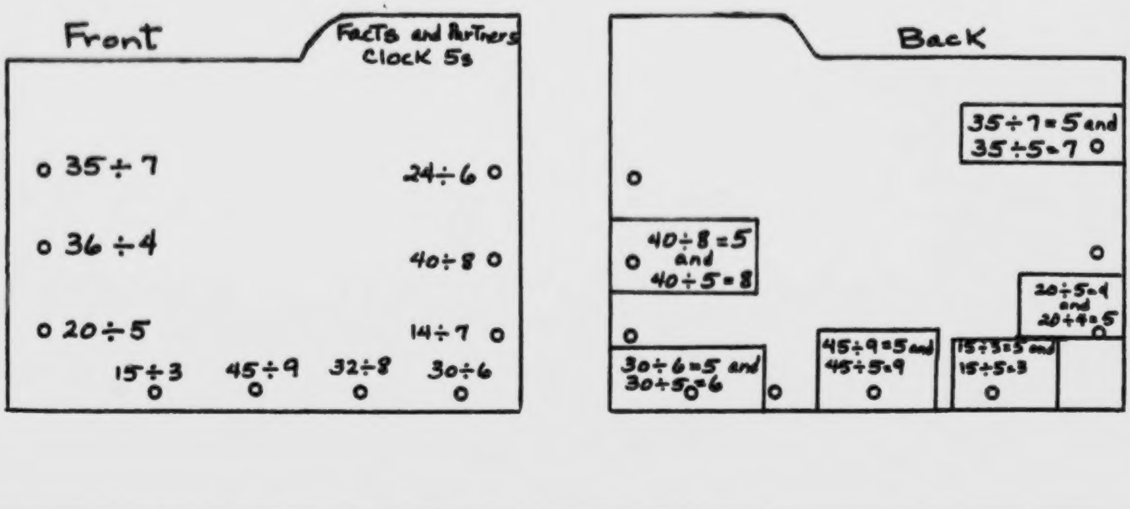
- *Number Fact Wheel* —an individual activity. (Materials: ÷5/ x5 number fact wheel based on the pp.168-69 pattern. On the front of each wheel write: "Don't know? The pattern will help.") The student answers each ÷5 fact, then turns the wheel over and multiplies to check. Students can keep track of the number correct, or of the time taken to get back to the green dot starting place, and try to better their record the next time.

Partner Facts

It will prove helpful to students in the long run if you take the time also to focus on related division facts. Use the following activity and others on pp. 92-94. **Emphasize:** "Same whole, same factors: good partners."

- *On the Back.* (Materials: For each pair of students—a file folder similar to that shown, with a hole to insert a pencil beside each fact. The front should contain Clock 5 Partner Facts: 15 ÷ 3, 20 ÷4, 30 ÷ 6, 35 ÷ 7, 40 ÷ 8, 45 ÷ 9 and other distractors. The back side should show Clock 5s and partner facts. No facts are written on the reverse side of distractor facts.)

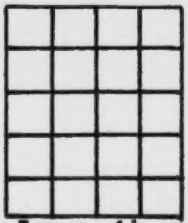
  Working in teams of two, one student pokes a pencil through the hole beside a fact on the front side and tells what is written on the back by the hole. The other student keeps tally of correct pokes.


Front
Facts and Partners
Clock 5s
35 ÷ 7
24 ÷ 6
36 ÷ 4
40 ÷ 8
20 ÷ 5
14 ÷ 7
15 ÷ 3
45 ÷ 9
32 ÷ 8
30 ÷ 6
Back
35 ÷ 7 = 5 and
35 ÷ 5 = 7
40 ÷ 8 = 5
and
40 ÷ 5 = 8
20 ÷ 5 = 4
and
20 ÷ 4 = 5
30 ÷ 6 = 5 and
30 ÷ 5 = 6
45 ÷ 9 = 5 and
45 ÷ 5 = 9
15 ÷ 3 = 5 and
15 ÷ 5 = 3

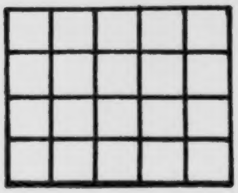
Family of Facts

To consolidate fact work for Clock 5s and to build or reinforce important number relationships, it will prove helpful to take the time to focus on fact families. Use the following activity and others on pp. 94-97.
Emphasize: "To know one is to know all in the family."

- *Red Light.* (Materials: Flash cards for ÷ 5 facts; graph paper grid [may use that provided for Break Apart Facts in Appendix C] or a transparency of this grid; red contruction paper [traffic light] circle; individual chalkboards.) Appoint one student to hold the red traffic light signal. As each card is flashed, students answer the fact (in unison), then WRITE and SHOW other facts in the same family. The student holding the red light interrupts the activity every third or fourth card by holding up the red light and saying, "Stop!" Then all draw a rectanglar shape to illustrate the family of facts. Call on one student to illustrate aloud:



**20 ÷ 5 rows = 4 in each row;
5 fours (5 x 4) = 20.**

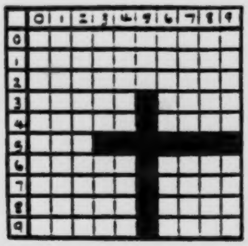


**20 ÷ 4 rows = 5 in each row;
4 fives (4 x 5) = 20.**

Appoint a new traffic officer and continue as above.

Check Up FOCUS ON 15 ÷ 5, 20 ÷ 5, ... 45 ÷ 5,
their partner facts: 15 ÷ 3, 20 ÷ 4, ... 45 ÷ 9,
... and other facts previously studied.

Appendix A: Jiffy Quizzes:
- Division 3-4



When most students have mastered these facts, mark them off the Class Cross Off Chart.

Zeros and Ones

There are 17 Ones and 9 Zeros: $1 \div 1, 2 \div 1, 3 \div 1, \ldots 9 \div 1$;
—and partners: $2 \div 2, 3 \div 3 \ldots 9 \div 9$.
Also, $0 \div 1, 0 \div 2, 0 \div 3, \ldots 0 \div 9$.

Look Ahead Check for a clear understanding of the multiplication concept.

Note: Instruction for these special facts would emphasize:

- Being able to use counters to dramatize/illustrate these facts;
- Being able to SORT OUT facts which have answers of zero or one from those that do not. For zeros, students should be able to identify which are "not allowed."

To achieve the latter goal, work with partner facts is introduced quite early in the teaching sequence.

Zeros

Teach a Strategy

- *Nothing for Anyone!* (Materials: Empty box or packet.) Ask four students to come up. Tell them the four of them can share whatever is in the box (your pocket) with them. Have them look into the box to conclude that $0 \div 4$ is the divsion fact for sharing what is in the box. "How many things will each of you get?" (None. Record $0 \div 4 = 0$ on the board.) Repeat for other numbers of students, and finally for the class as a whole. Examine the board list to conclude that 0 divided by any number equals 0: "Nothing for anyone, for there is nothing to share."

Use the Strategy

- *Anything to Share?* (Materials: Workpage of division problems. Include many $0 \div n$ problems [n = any counting number]. Be sure to include more than just 1-digit divisors for 0 dividends.) Have students circle all problems in which the answer equals 0—those for which there is "Nothing for anyone, for there is nothing to share." As students finish, they can compare with a neighbor, and count the number of zero quotients. Call on a student to tell the number of problems they found that did NOT have anything to share.

Multiply to Check

Help students develop a good sense of the division-multiplication relationship through activities like the following and others on pp. 89-91. **Emphasize:** "When you know multiplication, you know division, too."

- * *Zero or MORE?* (Materials: Workpage from the *Anything to Share* activity.) Call out a problem number (e.g. problem number 12; or the problem in row 2, third problem). Students form a 0 with their hand if the product of the quotient and divisor equals 0, and hold thumbs up if this product is more than 0.

- * *Number Fact Wheel* —an individual activity. (Materials: ÷5/ x5 number fact wheel based on the p. 169 pattern. On the front of each wheel write: "Don't know? The pattern will help.") The student answers each ÷5 fact, then turns the wheel over and multiplies to check. Students can keep track of the number correct, or of the time taken to get back to the green dot starting place, and try to better their record the next time.

No Partner Facts: Division by 0 is Not Defined

Use the following activity to introduce or reinforce the fact that, because the same product is not always obtained when one tries to multiply to check, then division by 0 is not defined..

- * *No! No! Not Allowed.* (Materials: Workpage from *Anything to Share* activity.) Copy two or three problems from the sheet onto the board to review that one can multiply to check division work. For example:
  - 0 ÷ 6 = 0 checks because x0 = 0;
  - 12÷ 3 = 4 checks because 3 x 4 = 12.

  But problems with 0 divisors give inconsistent results.

  0 ÷ 0 = ?

  ANY number x 0 = 0!

  4 ÷ 0 = ?

  NO number x 0 = 4!
  (Replacing 4 by any other non zero)

  So dividing by 0 is a No! No!—and NOT allowed.

Small Families

To consolidate fact work for Zeros and to build or reinforce important number relationships, it will prove helpful to take the time to focus on fact families. Use the following activity and others on pp. 94-97. **Emphasize:** "To know one is to know all in the family. Zeros have small families (only three facts)."

Example: 6 x 0 = 0, 0 x 6 = 0, 0 ÷ 6 = 0.

* *One Great Family.* (Materials: Paper scraps with three numbers written on each—those that can be used to write facts in a "family.") As students enter the room after lunch or other activity, point to those who should pick up a paper scrap near the door and write on the board all facts in a family (without answers) using the numbers.

Other students try to copy and complete as many families as possible before time is called. Do a quick check of board work, getting students to join in giving oral answers. Verbally emphasize that Zero facts have small families. Collect student papers to encourage accountability.

Examples:

0, 4, 0

0 x 4 = ___; 4 x 0 = ___; 0 ÷ 4 = 0.

2, 6, 3

2 x 3 = ____; 3 x 2 = ____;
6 ÷ 2 = ____; 6 ÷ 3 = ____.

Choose

* *Sort!* (Materials: Cards for Zero facts and other review facts; include addition, subtraction and multiplication cards involving single and multi-digit numbers with 0. Some activities will require 0 divisor cards as distractors.) Over a period of several days, carry out Sort activities like the following. When division Ones are taught; integrate fact cards for Ones in these activities.

—Have students form a 0 with their fingers if the answer is zero, and hold thumbs down otherwise.

12)0
6)0
3)0
0)7
0)6
= 0

—Have students hold thumbs up if the answer is 0; thumbs down otherwise. Occasionally call on a student to give a different problem having 0 as an answer.

—Have students work in small groups to sort the cards into three piles: 1) those with 0 as an answer; 2) those (÷0) cards that are not allowed, and 3) others.

Emphasize: "When there's nothing to share, there is nothing for anyone."

Ones

Teach a Strategy

* *Grab!* (Materials: 10-12 small counters for each pair of students.) Taking turns, one student takes a handful of counters and keeps them. This action illustrates taking counters and sharing only one way—that is, keeping all the counters. The other writes the ÷1 fact to match. To wrap up the activity, call on several students to write one of their ÷1 facts on the board and describe the situation for which it was written.

Example: 4 + 1 = 4. "I took four counters and shared one way—so I kept all four."

Emphasize: Because of the one-way share, what you have after the grab is what you get."

Extend to multi-digit numbers + 1 and lead students to conclude that, because of the one-way share, any number +1 "stays the same."

Use the Strategy * *My Turn! Your Turn!* (Materials: Box of small chips or other counters; individual chalkboards.) Students take turns with a partner. One writes a +1 fact with answer on the chalkboard. The other uses chips and describes the on-way share to check the answer that is written.

Emphasize: "Because of the one-way share, what you have after the grab is what you get."

Multiply to Check

Help students develop a good sense of the division-multiplication relationship through activities like the following and others on pp. 89-91. **Emphasize:** "When you know multiplication, you know division, too."

* *Check!* (Mateials: Individual chalkboards; Cards for Division Ones and other review facts and cards for related multiplication facts.) Distribute the cards to students. Then, as you call out one division fact (e.g., 6+1), the child holding the card comes to the front of the room, answering the fact on the way.

Others try to WRITE and SHOW the Multiply to Check fact before the child holding this addition card brings it to the front, touches it to the related division fact, and sayss "Check!, because ____ (in this case, 6 x 1 = 6.)"

Partner Facts

It will prove helpful to students in the long run if you take the time also to focus on related division facts. Use the following activity and others on pp. 92-94. **Emphasize:** "Same whole, same factors: good partners."

**Take Some, Share All. Each Gets One.* (Materials: 10-12 small counters and an individual chalkboard for each pair of students.) Students take turns with a partner. One takes a handful of counters, counts them, and shares that many ways so each gets only one counter. The other writes the matching division fact.

Example: For 6 counters, share 6 ways, and each gets one counter. Write: $6 \div 6 = 1$.

Have several students tell about the counters and the matching number fact that was written. Retain the board list and lead students to generalize that any number divided by itself equals 1. Extend to multi-digit numbers having an answer of 1 (e.g., $23 \div 23$, $56 \div 56$, and so on).

Family of Facts

To consolidate fact work for Ones and to build or reinforce important number relationships, it will prove helpful to take the time to focus on fact families. Use the following activity and others on pp. 94-97. **Emphasize:** "To know one is to know all in the family."

* *Write! Write!* (Materials: Individual chalkboards for students and a supply of chips for the teacher.) For each division fact on the board, students answer in unison and then WRITE and SHOW other facts in the same family. Occasionally call on a student to use counters to validate that the facts written are in the same family as that presented by the teacher.

Choose

* *Sort!* (Materials: Cards for ÷1 and other division review facts. Include addition, subtraction and multiplication cards involving single and multidigit numbers with 1.) Over a period of several days, carry out Sort activities like the following.

—Have students hold thumbs up and answer just those facts which have and answer of 1. Occasionally ask students to "Multiply to check," to give the partner fact, or other facts in the family.

—Have students hold both hands high overhead if the answer "stays the same"; stoop low otherwise. Each time, after identifying the Ones fact, call on a student to say the product aloud. Occasionally call on another student to give a different problem in which the answer "stays the same."

—As above, but from time to time let students in some way dramatize or illustrate to check.

—Have students work in small groups to sort the cards into piles: 1) those in which the answer "stays the same"; 2) those having 1 as an answer; and 3) others.

Speed Up * *Seven is Heaven*. (Materials: Paper folded in fourths and each part numbered 1 through 7 as on pp. 166-67.) Students keep the paper folded so they work only on one fourth of the page each time.) Enter Division Ones and other review facts on your copy of the score sheet to form a calling sheet. Call out the facts one at a time and have students write the answers on their sheets. The length of time allowed for students to write an answer should gradually be decreased from one game to the next.

Example: in the first game, allow up to 5 seconds for each answer; in the second allow 4 seconds for each answer; in the third, 3 seconds; and in the fourth game, 2 seconds for each answer.

Use the same review facts for each game along with a mix of Ones, but vary the order each time.

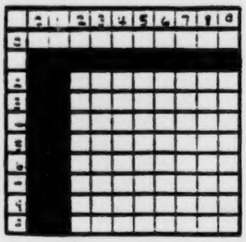
Check Up **FOCUS ON** the following facts:

Appendix A: Jiffy Quiz:
• Division 5

1÷1, 2÷1, 3÷1, ... 9÷1; their partners: 2÷2, 3÷3... 9÷9;
0÷1, 0÷2, 0÷3, ... 0÷9;

...and other facts previously studied.

When most students have mastered these facts, mark them off the Class Cross Off Chart.



Pattern 9s

Verbal Prompt: "See ÷9? What's the pattern?"

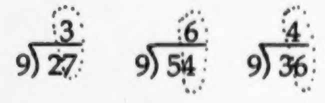
There are 11 Pattern 9s not previously studied in this sequence:
27÷9, … 72÷9, 81÷9 -- and their partner facts: 27÷3,... 72÷8
(excluding 45÷9 and 45÷5, although these facts typically are reviewed).

Look Ahead For those students who use finger pattern recognition for division 9s, immediate finger pattern is important. See *Quick Fingers* and *Tuck,* p. 71.

Teach a Strategy

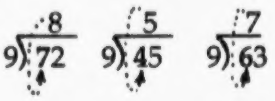
- *It's in the Numbers!* (Materials: Calculators.) Let students use calculators or multiplication to answer ÷9 division facts you write on the board. Lead students to verbalize patterns they note in the numbers of each example. Sample patterns are illustrated below.

Pattern 1



The sum of the quotient and last dividend digit is 10.

Pattern 2

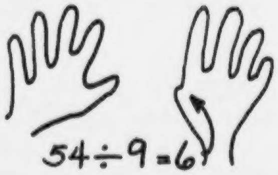


The answer digit is always 1 more.

Pattern 9s
3
9)27
6
9)54

Note: Teachers of slower students often present only one pattern in a session so as not to confuse. If more than one pattern is presented, individual students should be allowed to select and use what seems most helpful.

* *Finger Pattern*. (Materials: Calculators.) Let students use calculators or multiplication to answer ÷9 division facts you write on the board. Then select on fact (e.g. 54 ÷ 9) and ask students to form the dividend with their fingers. "What finger did you fold under? ... Yes, the ANSWER finger." Repeat for other facts.



Use the Strategy

* *Chain Up*. (Materials: Several construction paper strips for each student--seasonal colors.) Give each student several strips and direct them to write a ÷9 fact on each. As you pass individual desks during the day, select a strip at random and ask the student to answer it. Give credit both for immediate correct answers and for those correctly derived using a finger or number pattern. Use this opportunity to check that individual students who do not know the 9s are using a correct procedure for deriving them. Those who respond correctly should add their strip to the "class chain" which, when long enough, can be hung as part of the room decoration.

Choose

* *Give a Clap*. (Materials: Flash cards for ÷9 and other division review facts.) Ask students to put their hands on their desks, palms down, and to clap and answer just any ÷9 facts you flash. Occasionally call on a student to tell how the answer could be worked out using a number or finger pattern.

Speed Up

* *Cover!* (Materials: Scrap paper and masking tape; flash cards of facts that are hard for most students.) While students are out of the room, place flash cards of difficult facts along the chalk ledge, answer side showing. When they return, ask students to copy three facts, with answers, which they think are hardest for themselves or most other students in the room, and tape the paper to their desks. As you pass a student during the day, whisper, "Cover!" and say one fact. If the students answers correctly, draw a star beside it. Change facts or collect cards on an individual basis as students learn the facts.

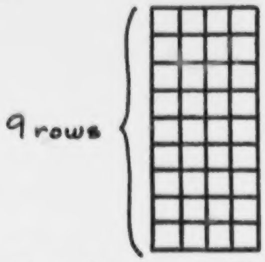
Note: If a students knows all the facts, then instead of 6 x 8 (for example), ask for 60 x 8 OR 60 x 80 OR 6 x 8 + 7; and so on.

* *Tape Up.* (Materials: Tape rolls for chalkboard; flash cards for ÷9s and other division review facts.) Before students come into the room write the numbers to nine in order along the board and place several tape rolls under each. As students enter, they take a flash card and press it against a roll of tape beneath its answer on the board.

Multiply to Check

Help students develop a good sense of the division-multiplication relationship through activities like the following and others on pp. 89-91. **Emphasize:** "When you know multiplication, you know division, too."

* *See, it Checks!* (Materials: Page of division facts; graph paper—could use that provided for Break Apart facts, Appendix C.) Suggest that students select one or two "favorite" problems on the page and do these first. Beside each, they should write the "Multiply to Check" fact and then draw a rectangle on the graph paper to illustrate that the correct "Check" fact has been written. Move among students and ask them individually to illustrate and verbalize for you both the division and its multiply to check fact.



36 ÷ 9 rows = 4 in each row because 9 fours (9 x 4) = 36.

- *Number Fact Wheel* —an individual activity. (Materials: ÷9/ x9 number fact wheel based on the pp. 168-69 pattern. On the front of each wheel write: "Don't know? The pattern will help.") The student answers each ÷9 fact, then turns the wheel over and multiplies to check. Students can keep track of the number correct, or of the time taken to get back to the green dot starting place, and try to better their record the next time.

Partner Facts

It will prove helpful to students in the long run if you take the time also to focus on related division facts. Use the following activity and others on pp. 92-94. **Emphasize:** "Same whole, same factors: good partners."

- *Tell Your Partner the Partner!* Students take turns with a partner. As each fact is written (by the teacher) on the board, one student quietly tells the partner the answer and the other states the division partner fact. Students try to complete this task before the teacher writes the answer and partner fact on the board.

Family of Facts

To consolidate fact work for Pattern 9s and to build or reinforce important number relationships, it will prove helpful to take the time to focus on fact families. Use the following activity and others on pp. 94-97. **Emphasize:** "To know one is to know all in the family."

- *Four in This Family.* (Materials: Flash cards for ÷9s; individual chalkboards.) Students work in teams of four. As you flash each card, one student copies and answers the fact on a slate. Others in turn write (and answer) one additional fact in the same family as the fact shown. When all facts in the family are written, the four students stand and show their slates.

Note: Get students to note that while 0 ÷ 9 (and other zeros) have small families of three facts, other ÷9s each have four facts in a family.

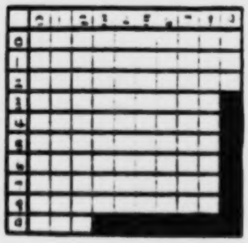
Check Up **FOCUS ON** the following facts and their partners:

Appendix A: Jiffy Quizzes:
- Division 6-8

27÷9, … 72÷9, 81÷9,
27÷3, … 72÷8,

...and other facts previously studied.

When most students have mastered these facts, mark them off the Class Cross Off Chart.



Multiply to Help Facts

Verbal Prompt: "Multiplication gives the division answer."

There are 25 other division facts:

(**9**,12,18,21,24)÷3;
(12,**16**,24,28,32)÷4;
(18, 24, **36**, 42,48)÷6;
(21, 28, 42, **49**, 56)÷7;
(24, 32, 48, 56, **64**)÷8.

Look Ahead Check for:

- A clear understanding of the division concept.
- Firm mastery of related multiplication facts.

Squares (facts in bold, above)

Perhaps the easiest of the remaining division facts are those in which *"the answer is in the problem":* the *squares.* It also is fairly easy with this group of facts to emphasize the "multiply to check" idea.

Teach a Strategy

* *It's in the Square!* (Materials: Graph paper—could use that provided for Break Apart facts, Appendix C; flash cards for division squares.) For each fact, have students draw a square for the dividend with as many rows as columns. Help students generalize that the figure each time is a square: the number in each row (the answer number) is the same as the number of rows (the divisor number).

Use the Strategy

* *Read my Mind!* (Materials: Flash cards for Division Squares and other division facts previously studied; individual chalkboards.) Draw a card and place it between the pages of a book so the numbers cannot be seen. Tell the answer and ask students to try to "read your mind" by writing and showing the hidden Division Square. If it seems helpful, remind students that "The answer is in the problem."

Choose

* *Stand Up!* (Materials: Flash cards for Division Squares and other division facts previously studied; individual chalkboards). Flash the cards, one at a time. Students stand up

when they see a Square. (Call on one student for the answer.) They otherwise write the answer on their boards and show it. When needed, remind students that "The answer is in the problem."

Speed Up

- *Flash, Flash!* (Materials: Division flash cards; envelope of answer cards, 0 - 9.) Students lay out the cards 0 - 9 in a row across the top of their desks. As each card is flashed by the teacher, the child flashes back the answer card. See to it that the facts of this lesson come up more often than others.

- *Hot Number!* (Materials: Division flash cards; individual chalkboards.) Designate one number to be the "hot" number by writing it on the chalkboard. As cards are flashed, they answer (in unison) for all but the "hot" number. For this quotient students call out: "Hot! Hot!"

- *Only If!* (Materials: Division flash cards; individual chalkboards.) This activity is the reverse of the above. Write one quotient number on the board and have students answer ONLY IF the answer to a card flashed is the number designated. Students otherwise show a blank slate, the signal for the teacher to call upon one student to give the answer orally.

Other Division Facts:

Multiply to Check Facts Can Help

Teach a Strategy

- *Share Out!* (Materials: Unifix cubes or other counters.) Students separate cube trains to model each division fact you write on the board cube trains. Call on one student to tell the answer. Then call on another student to state and model (by pushing cube trains back together again) the Multiply to Check fact.

  Example:
  "12 shared with 3 equals 4 to each because 3 fours = 12."
  (12 ÷ 3 = 4 because 3 x 4 = 12.)

  Emphasize that "multiplication gives the division answer."

Use the Strategy * *Multiplication Helps*. (Materials: Unifix cubes.) Write several of the four new facts on the board. In a separate list, write the related multiplication facts. Have students circle the number in each multiplication problem that gives a division answer. Have students complete the problems, then draw a line between each quotient digit and the corresponding number in the multiplication problem. Emphasize that "multiplication gives the division answer." For at least one problem, repeat the *Share Out* procedure in the previous activity to check.

Choose * *No! Can't Be!* (Materials: Envelope of digit cards 2 - 9; Division flash cards for the facts of this lesson and cards for related multiplication facts.) Give the envelope of digit cards to one student. After you show the division side of each flash card (e.g. 28 ÷ 4), the student holding the envelope draws and reads a number from the envelope (e.g. 4). All hold thumbs up if it is the CORRECT answer; thumbs down otherwise. For thumbs down situations, as for this example, immediately call on one student, saying: "No! Can't Be because ... (student should respond 28 ÷ 4 is not 4, because it doesn't check when you multiply. 28 ÷ 4 = **7** because 4 x **7** = 28)." For at least one or two facts, use counters, graph paper or array cards to illustrate the division/ multiplication relationship.

Speed Up

* *Race Row.* (Materials: Worksheet with rows (or columns) of division facts. If possible, emphasize the new facts of this lesson.) Give students time to "study" the first two rows on the page. Help them with any difficult facts. Remind them that "multiplication gives the division answer."

Then say, "Your Race Row is row ___." Allow about two seconds per fact, then call "Stop!" and check answers. [On the first few rounds of this activity, some teachers instead watch the slowest student in the class, so that success can be experienced by all. In later rounds, the timing is more precise.] Let students draw stars by rows if they beat the time with correct answers. Repeat for other rows (columns) on the page.

Division Partner Facts

Verbal prompt: "Same whole, same factors: good partners."

To reinforce previous work in this lesson and to focus on number relationships, take the time to focus on partner facts—those that have the same *whole* (dividend) and the same *factors* . Use the following activity and others on pp. 92-94.

Example: 42 ÷ 6 = 7 and 42 ÷ 7 = 6.

* *Scramble.* (Materials: Flash cards for division facts of this lesson, excluding squares. Tape these randomly to the wall near the door in pairs: one fact on top, its partner underneath.) As you point to a student passing in or out of the classroom, the student touches one fact and says its answer. The student next in line should state and answer the Partner fact. Students can lift to check.

Variation: The teacher should designate which division fact should be answered by a student.

Family of Facts

To further consolidate fact work for the facts of this lesson and to build or reinforce important number relationships, also take the time to focus on fact families. Use the following activity and others on pp. 94-97. **Emphasize:** "To know one is to know all in the family."

Example: 42 ÷ 6 = 7, 42 ÷ 7 = 6, 6 x 7 = 42, 7 x 6 = 42 (typical family);
64 ÷ 8 = 8, 8 x 8 = 64 (small family).

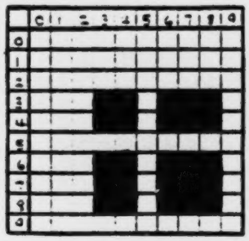
* *Out to Lunch.* (Materials: Flash cards for division facts of this lesson and related multiplication facts.) Distribute the cards to students. As students find other facts in the same family, they go to teacher, state the answers, and go to lunch.

Check Up FOCUS ON the following facts:

Appendix A: Jiffy Quizzes:
- Division 9-13

(9,12,18,21,24) ÷ 3; (12,16,24,28,32) ÷ 4;
(18, 24, 36, 42, 48) ÷ 6; (21, 28, 42, 49, 56) ÷ 7;
(24, 32, 48, 56, 64) ÷ 8

... and other easier facts.



When most students have mastered these facts, mark them off the Class Cross Off Chart.

Rainy Day Activities

Activities like the following can reinforce number fact learning and brighten a rainy day. Many require room and space to get up and move about.

- **Twister.** (Materials: Papers or cards with facts/answers. If possible laminate these for reuse.) Taking turns, children lay the papers or cards on the floor, then get down on all fours to place:

  —one hand on fact, one on answer; one foot on a different number fact problem, the other on its answer.

  —hands and feet on four facts in a family.

  —one hand on a division fact, one on its "Multiply to Check" fact; one foot on a different division problem, the other on its Multiply to Check fact.

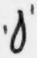
  —one hand on a division fact, one on the related division fact (partner—e.g. 35 ÷ 5 and 35 ÷ 7); one foot on a different division fact, the other its partner.

  —hands and feet on related facts and their answers (e.g. 2 x 7 = 14, so 4 x 7 = 28 —twice as much).

  . . . and so on.

Note: While one student twists, others could verify using graph paper grids, unifix cubes, or a calculator..

- **Match Up!** (Materials: Seasonal cutouts, as suggested below, with matching answer key.) Prepare an envelope of seasonal cutouts:

September: apples
October: pumpkins
November: turkeys
December: trees or bells
January: snowballs
February: hearts
March: shamrocks
Easter: eggs
April: raindrops 
May/June: flowers

Write:

—fact on one half, answer on the other; or

—division fact on one half, its Multiply to Check fact on the other;

—division fact on one half, its partner fact on the other;

—harder multiplication fact on half, an easier helper fact on the other (e.g. 4 x 7 = 28, 2 x 7 = 14).

. . . and so on.

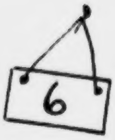
Cut the shapes in half (puzzle style) and distribute them. Children find their "match" and check with a key or calculator as is necessary.

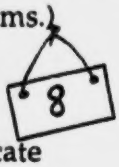
Mix the cards and repeat as time allows.

Multiply to Check
7)42
6
x 7

- **Seek and Find!** Use any set of matching fact-answer cards. Play as in Match-Up, but tape or pin cards to children's backs.

- **Snatch a Frog.** *Idea shared by Marge Anderson.* (Materials: stuffed frog, masking tape, flashcards, answer, cards on string which children can wear around their necks -- identical cards for each team.) Divide the class into two teams lined up opposite and facing each other several feet apart, depending on space available. (If the class is large, have 2 sets of two teams.) Use masking tape to mark the boundary for each team. A frog or other stuffed animal should be placed in the middle between the two teams.





  Distribute the answer cards to members of one team. Distribute a duplicate set to the other team(s). Then, as you show and say each number fact flash card, children on opposing teams wearing the answer card race to "snatch the frog" and win a point for the team.

- **Don't Peek! —Peek!** (Materials: Fact cards with no answers.) Children may stand anywhere in the room. Write answers to the fact cards in sequential order on the chalkboard (space out generously!), and distribute the cards, face down to children. Remind them: "Don't peek until I say so." When all cards are distributed, call "Peek!" as the signal for children to look at their card and stand by its answer written on the chalkboard. Check by asking students to hold up cards for you to see. Then mix the cards and repeat as time allows.

- **A Christmas Special.** *See directions on the following page.*

- **Fill the Stocking.** (Materials: Fill the Stocking fireplace scene on the page after "A Christmas Special.") Students write the answer beside each number fact and check it against the assigned row or group referee's paper. Then, for each fact, they look around the room for a Construction paper ornament with the number fact and its answer on it. Each time a fact ornament is found, students color the number fact and its answer bricks the same color as the ornament.

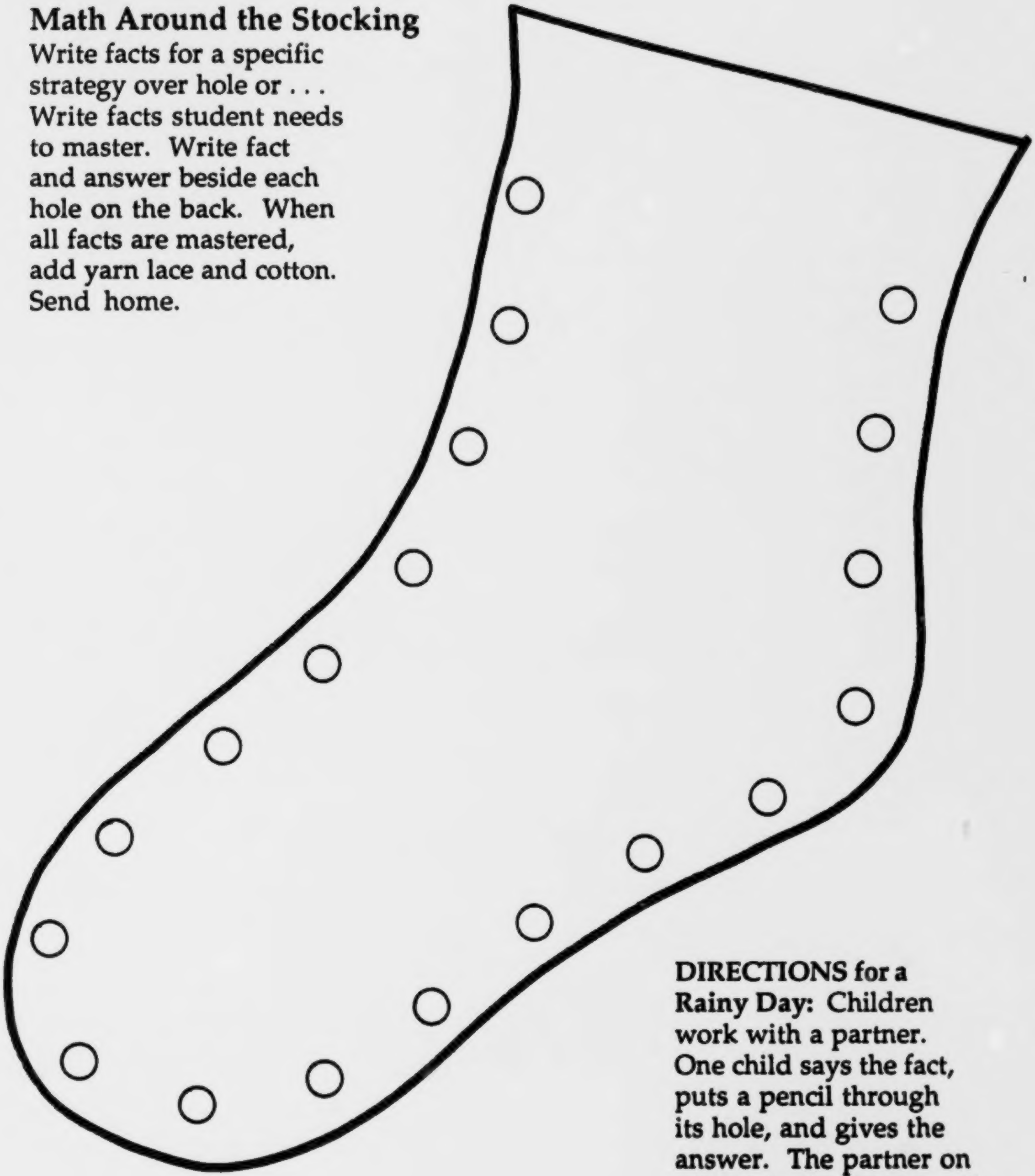
  When four bricks of one color are found, students check with the row referee. Color and cut out one topping to fill the stocking.

  Teams can be created: Monday's row against Tuesday's row; those wearing red against others —and so on. A jiffy quiz over the fireplace facts could follow.

A Christmas Special:

Math Around the Stocking

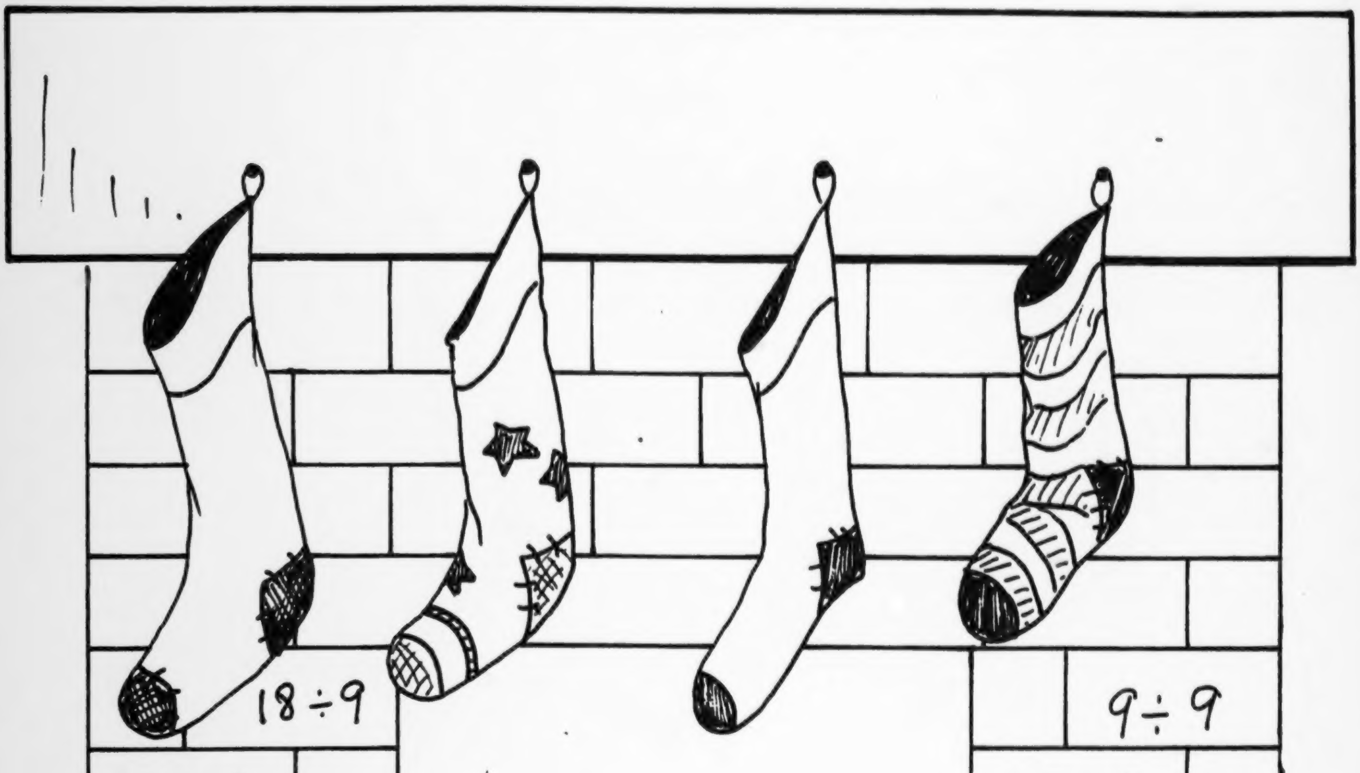
Write facts for a specific strategy over hole or . . . Write facts student needs to master. Write fact and answer beside each hole on the back. When all facts are mastered, add yarn lace and cotton. Send home.



DIRECTIONS for a Rainy Day: Children work with a partner. One child says the fact, puts a pencil through its hole, and gives the answer. The partner on otherside checks to see if correct. Children take turns "mathing" around the stocking.

*Idea contributed by Ann Stewart

Fill the Stocking



18 ÷ 9

81 ÷ 9

10 ÷ 5

63 ÷ 9

25 ÷ 5

72 ÷ 9

45 ÷ 5

15 ÷ 5

9 ÷ 9

27 ÷ 9

35 ÷ 5

40 ÷ 5

54 ÷ 9

20 ÷ 5

36 ÷ 9

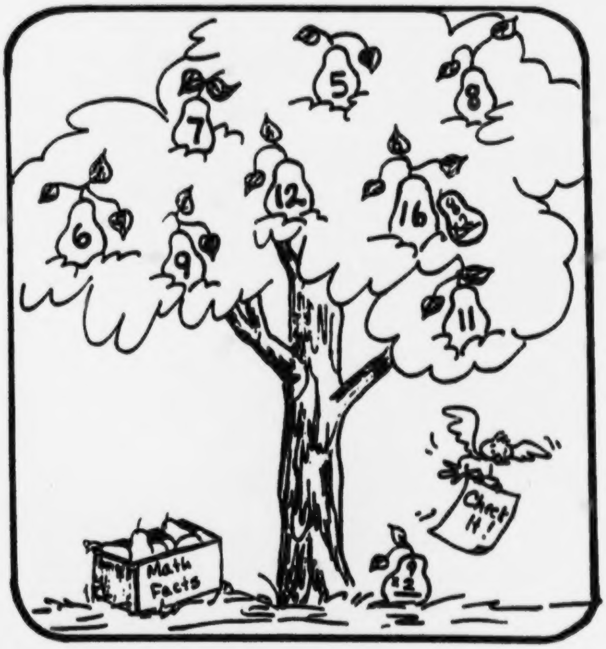
45 ÷ 9

Bulletin Board Activities

This section contains sketches of active learning bulletin boards for basic facts. For each month of the school year, a sample bulletin board idea is given. Each time, one sample activity for using the bulletin board in an active learning setting with students also is given. The ideas that are presented include suggestions for:

- whole class activities;
- partner activities;
- individual activities.

Sometimes the focus of the activity is on selecting helpful hints or strategies for learning certain number facts. Other times the focus is to review or practice facts. Ideas presented for one month, of course, can and should be adapted and used in other months.



Pear Tree Pair Up!

August/September activity idea:

Individual students match by pinning each number fact problem (from the box) near its answer on the tree.

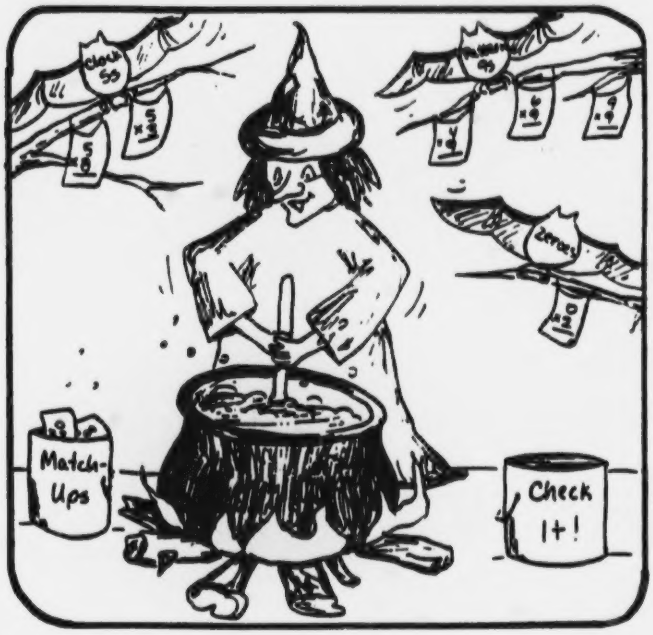
The bird holds an answer booklet which may be used for self check.

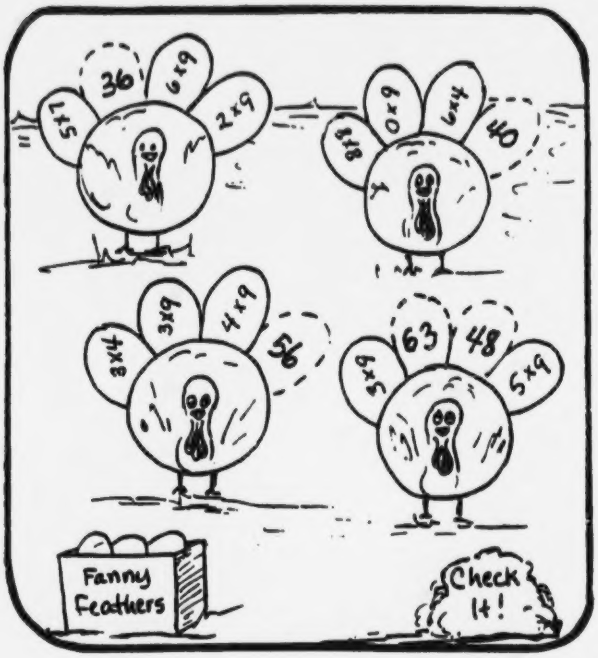
Halloween Hang Ups

October activity idea:

Individual students sort the number fact problems (in the Match Up bucket) by strategy. All Clock 5s, for example, are pinned on the branches by the Clock 5 bat.

The student studies the facts, checking against the answers provided in the Check It bucket. A partner then reads three facts near each bat for the student to answer.


Clock 5s
9s
Zeroes
Match-Ups
Check It!


5x7
36
6x9
2x9
8x8
0x9
6x4
40
3x4
3x9
4x9
56
3x9
63
48
5x9
Fanny Feathers
Check It!

Feather My Fanny!

November activity idea:

Two students work together. Taking turns, they draw a number fact fanny feather from the box, say the answer, and pin it over its answer on the turkey.

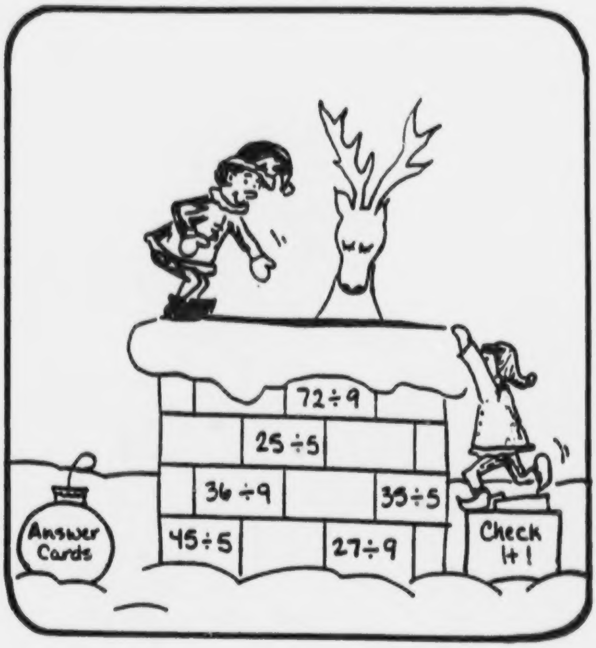
Students refer to the Check It sheet as necessary when they disagree or are not sure of an answer.

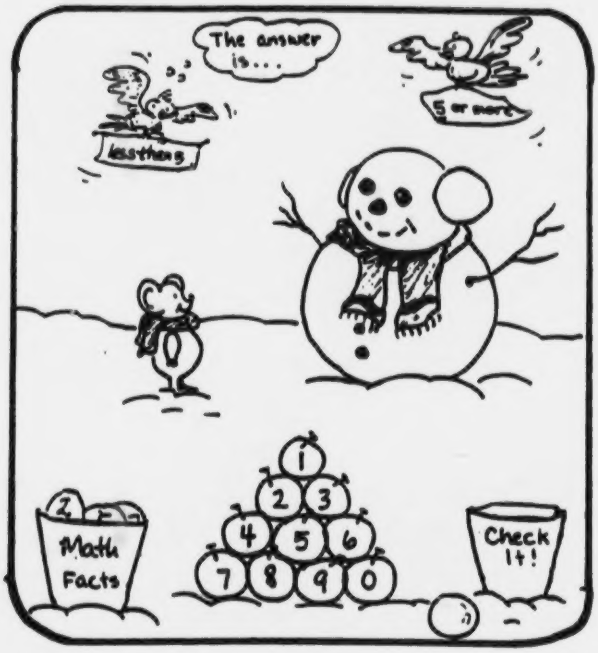
Up and Down the Chimney

December activity idea:

Use as a whole class activity, during transitional moments when there is time. Students raise fingers to show the answer to each fact as the teacher says and points to it.
After students respond, the teacher points to one student to say the answer aloud.

Individual students study the facts on their own time, using the Check It box to self check.


72÷9
25÷5
36÷9
35÷5
45÷5
27÷9
Answer Cards
Check It!


The answer is...
5 or more
less than 5
2
Math Facts
1
2 3
4 5 6
7 8 9 0
Check It!

Snowballs a Flying!

January activity idea:

Use as a whole class activity. Students hold thumbs up if the answer if 5 or more; thumbs down if the answer is less than 5. Each time, the teacher says or points to a student to tell the answer.

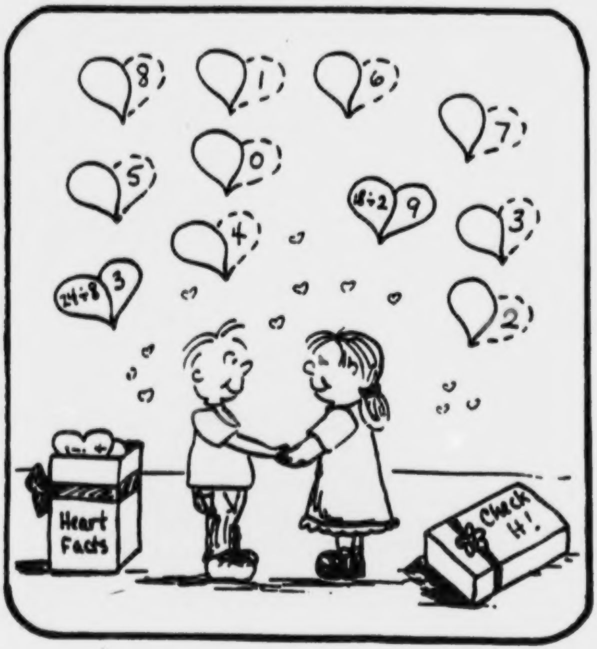
Individuals or pairs of students practice on their own time, using the key in the Check It bucket for self check. Students may enjoy laying the snowball fact on top of its answer, and later sorting snowballs into two piles: those with answers less than 5, and others.

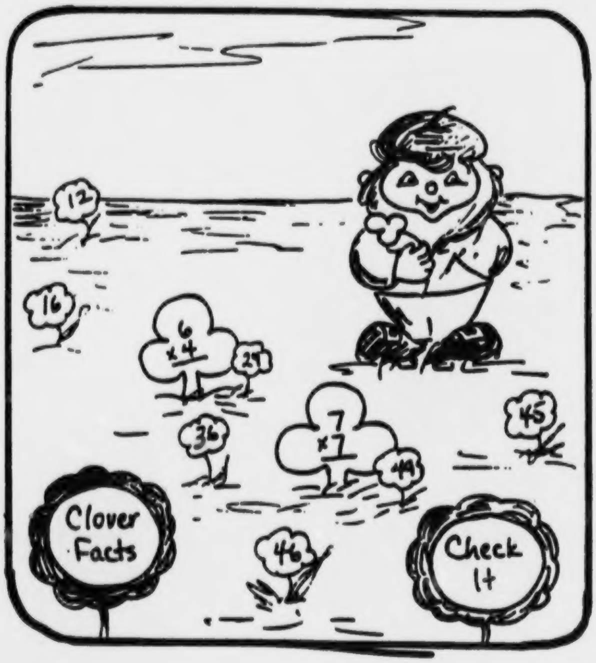
Heart to Heart

February activity idea:

Individual students match by pinning each number fact problem (from the heart box) beside its answer to form a heart.

The Check It box is used to self check.


8
1
6
7
5
0
18÷2 9
3
4
24÷8 3
2
Heart Facts
Check It!


12
16
6
×4
25
36
7
×7
49
45
Clover Facts
46
Check It

Lucky Clovers

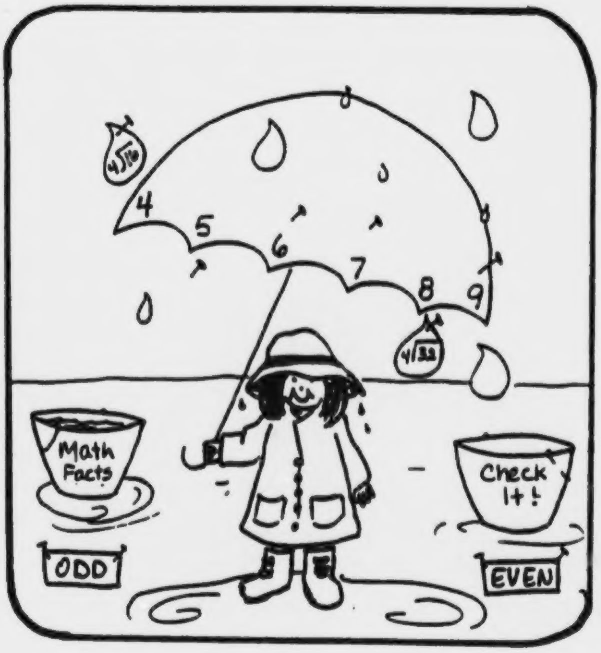
March activity idea:

Among students in the class—designate a Monday row, a Tuesday row, a Wednesday row (or group of students), and so on. All students in the row for the day pick up a clover fact and pin it near its answer on the bulletin board as they come into or leave the room.

Individuals or pairs of students practice on their own time, using the key in the Check It flower for self check.

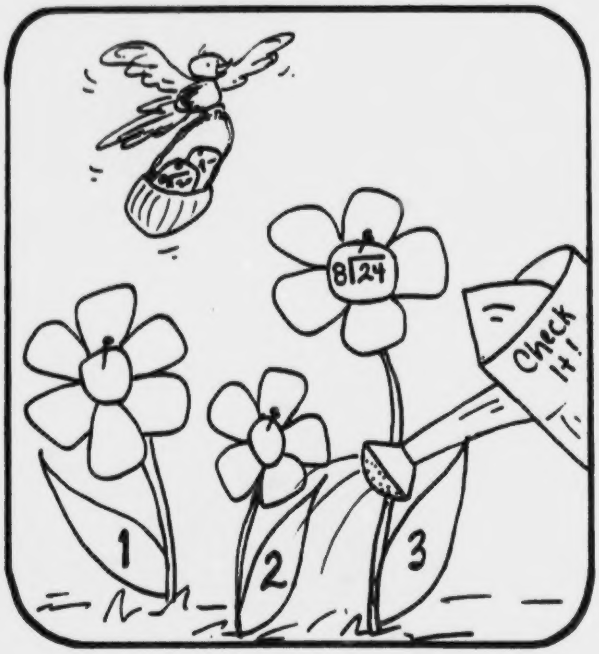
April Showers

April activity idea:



Taking turns with a partner, students pin each number fact problem (from the math fact bucket) near its answer on the umbrella, each time stating whether the quotient is odd or even. Students then sort facts into two piles: odd quotients; even quotients. The Check It bucket is used to check.

As a whole class activity, students hold thumbs up for odd, thumbs down for even quotients. Each time, the teacher should point to a student to say the quotient aloud.



Pretty Flowers

May/June activity idea:

The bird carries the math fact problems on flower centers. To start a partner activity, all flower centers are placed face up in a work area. Taking turns, one student calls an answer. The partner finds a problem to match and pins it into the center of the flower with the matching answer leaf.

The Check It bucket is used, as necessary, for checking.

Extensions of Basic Facts

As occasions arise, capitalizing upon certain natural extensions of number fact work can reinforce concept understanding for an operation, help children develop a better sense of number, and nurture their ability to "think mathematically." Sample ideas for carrying out work of this type are given below. Activity like that suggested contributes to broader goals in mathematics, for it frequently engages students in special types of "problem solving" situations that stimulate them to be flexible in their thinking about number.

Traditionally we may have thought of doing activities of the type suggested only with talented youngsters, who relish and are good at doing them. But every child has untapped potential which may be spurred by participating regularly in more exciting and challenging aspects of mathematics.

Extensions Related to Decision Making

- **What's the sign?**

  8   2 = 4   5   3 = 18
  8   2 = 16   6   3 = 2

- **Does the turnaround give the same answer?** (Help children generalize that multiplication turnarounds do; division turnarounds do not.)

  Hold thumbs up if the turnarounds give the same answer:

  6 x 4 and 4 x 6; 8 + 4 and 4 + 8...

  Note: Refrain from stating that division turnarounds "don't work"; or that you "can't do" problems like 4 + 8. In later grades children will study fractions, where an answer to problems like this clearly CAN be determined. Rather, emphasize that "division turnarounds do not give the same answer."

- **What Size Family?** Think about and tell me some facts that have four-member "families;" (e.g., 15+3, 15+5, 5x3, 3x5) some which have less than four members. (Squares have two-member families. Zeros have three-member families.)

- **When do Patterns Help?** Think about and tell me which facts that involve number patterns? (Help them generalize that 9s in both multiplication and division involve special number patterns.

- **When do Pictures Help?** Think about and tell me some facts that involve picture clues. (Help them generalize that 2s, 5s, and Break Apart facts in both multiplication and division involve visual clues.

Extensions Related to Patterning

- **Flash and Write**. (Materials: Flash cards for facts currently being included in SPEED UP activities.) As you flash a set of cards, have children copy just the answers on paper. Ask children to raise their hands as soon as they note a pattern in the answers For example: sequential odds; sequential evens; 12,14,12,14, ...; 12, 12, 24, 12, 12, 24...; all answers ending in 5 or 0, ...; and so on.

Extensions Related to Mental Math

- **Mental Multiplication: Multiples of 10.** (Materials: Calculator and individual chalkboards for each student.)

  Write the following problems on the board. Ask students for and write the answer to each. Allow students to use a calculator on the difficult ones. What is:

6 x 8? (48)	60 x 8? (480)	3 x 5? (15)	30 x 5? (150)
9 x 4? (36)	90 x 4? (360)	7 x 8? (56)	70 x 8? (560)

  What pattern do you note in the problems with zeros? *(Multiply the non zero parts, and end the answer with the tail end zero.)*

  As I write these problems, use your calculator to check whether this pattern holds for larger problems.

  20 x 60 =? (1200); 50 x 50 =? (2500); 70 x 60 =? (4200).

  What pattern do you see? *(Multiply the non zero part, and end the answer with the tail end zeros)*

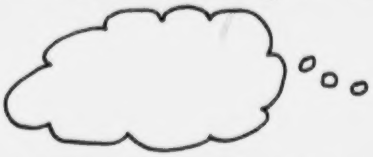
Take your slates. As I write these problems, WRITE and SHOW just the answers. Remember to multiply the non zero part, and then the answer with the tail end zeros. Ready?

30 x 80 (2400); 90 x 6 (540); 80 x 80 (6400); 30 x 30 (900);
40 x 9 (360); 70 x 40 (2800); 9 x 70 (630); 20 x 80 (1600)

Continue as time allows.

- **Mental Division: Closest Helper Fact.** (Materials: Box of paper clips; one copy of the Multiplication Chart on the following page for each student.)

We're going to use the Multiplication Chart to help with division today. *Write the following on the board:*



$5\overline{)27}$

Let's use the Multiplication Chart for 27 ÷ 5. Since we are dividing by 5, find the row that starts with 5. Slide your finger across the row. Stop between the numbers where 25 would be. (Yes, between 25 and 30).

We don't have 30 to share with 5, just 27. So move your finger back to 25. 25 ? 5 is the closest helper fact. *Write 25 ÷ 5 in the bubble:*

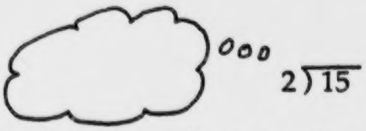
$5\overline{)25}$ $\qquad$ $5\overline{)27}$

What's 25 ÷ 5? (5). So when you share 25 with 5, each gets 5 and there's some left over. *Use counters to act this out.*

Multiplication Chart

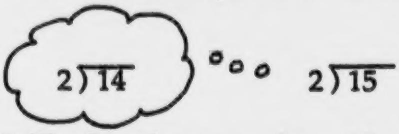
x	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

Let's try another:



Let's use the Multiplication Chart for 15 ÷ 2. Since we are dividing by 2, find the row that starts with 2. Slide your finger across the row. Stop between the numbers where 15 would be. (Yes, between 14 and 16.)

We don't have 16 to share with 2, just 15. So move your finger back to 14. 14 ÷ 2 is the **closest helper fact.** Write 14 ÷ 2 in the bubble:



What's 14 ÷ 2? (7). So when you share 15 with 2, each gets 7, and there's one left over. *Use counters to act this out.*

Repeat for each of the following problems. The emphasis, at this time, is not on answers but in writing the **closest helper fact.**

13÷6; 17÷8; 36÷5; 9÷4; 23÷5; 15÷7; 41÷5.

- **Double Up**—Double 2-digit numbers. (Materials: Dark crayon and paper for each student.)

—Take a crayon and draw 2 rows of 7 . . . Now DOUBLE your paper over to hide the dots and rub HARD (with a fingernail).
—You started with 2 rows of 7. How many dots? (14) How many rows of 7 will you have after you rub? (4) *Open to check.*
—You started with 2 sevens, or 14 dots. *Write 14 as shown.*

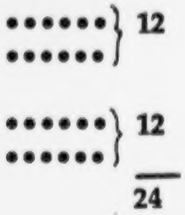
$$\left.\begin{array}{l}\bullet\bullet\bullet\bullet\bullet\bullet\bullet\\ \bullet\bullet\bullet\bullet\bullet\bullet\bullet\end{array}\right\} 14$$

You rubbed 2 more sevens. WRITE 14 again.

$$\left.\begin{array}{l}\bullet\bullet\bullet\bullet\bullet\bullet\bullet\\ \bullet\bullet\bullet\bullet\bullet\bullet\bullet\end{array}\right\} 14$$
$$\begin{array}{r}\\ \hline 28\end{array}$$

IN all, that 4 sevens, or 28. (Draw a line and write the total: 28.)

Repeat a few times with other numbers.



—What number did we double to get 12? (12)

—Let's double other numbers.
—*Give other numbers orally which you don't write on the board. (11, 13, 22, 32, . . .)*

- **Star Number Activity.** (Materials: Flash cards for multiplication Clock 5s, Pattern 9s, Picture 2s, Doubles and One a Week facts.)

  —Stand up. Let's play **STAR NUMBER** today. 10 is my "Star number." *Write 10 inside a star on the chalkboard.* When I show a card, I want you to stoop low if the answer is less than 10; stand tall if the answer is more than 10. If the answer is 10, clap your hands. Ready? *Show the first card. After students signal their response each time, call on one student for the answer and provide feedback relating to more/less. For 2 x 6, for example, when a child answers 12, say: "Good, you stood." 12 is more than 10.*

- **What's the Remainder?** (Materials: Individual chalkboards.) I'm not interested in the answers to the problems I'm going to write. Each time, I want you to WRITE and SHOW just the remainder. Ready?

17 ÷ 5 (2)	14 ÷ 5 (4)
16 ÷ 3 (1)	15 ÷ 2 (1)

Continue. From time to time, use objects to illustrate that what was said makes sense.

- **I'm Thinking of a Number.** (Materials: Individual chalkboards.)

  I'm thinking of a number. I'll give you clues. WRITE and SHOW the number when you know it. Ready?

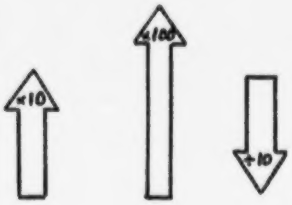
  It's between 3 x 4 and 5 x 5.
  You say it when you count by 5s.
  You don't say it when you count by 10s. (15)

Ready for another?

It's more than 3 x 8 but less than 7 x 5?
If you divide by 5, the remainder is 3.
It's an even number. (28)

- **Arrow Math** (Materials: Individual chalkboards.)

Draw the following arrows on the chalkboard.



WEATHER
STATE

Take your chalkboards. Start with 8. *Write it on the board.* Do what I point to. Ready?
Start with 8—(point to x10, x100, +10). WRITE and SHOW your answer, (800). How did you get 800? (Let a student talk it through. *Remind students about tail and zeros. Do a calculator check, if this seems helpful.*

Let's try another. Start with 40 (point to +10, then x100, x10). WRITE and SHOW your answer, (4000).

Continue, as time allows.

Note: At a later time, also add a +100 arrow.

- **Multiply and Add.** (Materials: Individual chalkboards.)

Take your chalkboards. We'll multiply and add in our heads today. Don't write until I signal. Ready?

—What's 7x8, +6?	*Point to signal students to write and show the answer.* (62)
—What's 6x8, +8?	*Signal students to answer.* (56)

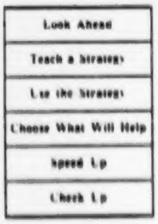
Continue, as time allows.

- **Cover!** (Materials: Flash cards for teacher; paper scrap and tape for students).

Place flash card facts you know are hard for students along the chalk ledge, answer side up. Ask students to copy the three "hardest" onto their paper (answer, too). "If none seem hard, copy three you think are hardest for most students."

As you pass a desk during the day, cover the paper and ask the student to answer one fact you give. For better students, ask instead for the number that's 3 more than the answer; or 6 less; or the answer x10; x100 . . .

Modifying Activities to Meet Learning Needs of Individual Children



Ideas drawn from the work and perspective of a specialist:
Margaret A. Toohey[*]

Children with learning difficulties and specific learning disabilities have unique learning styles consisting of both strengths and weaknesses. If these students are to acquire mastery of the basic facts, a match between instruction and learning style which accounts for weaknesses but capitalizes on learning strengths is necessary. The following guidelines and suggestions involve specific procedures which allow teachers to advantageously use the learning strengths of children. In general, it is helpful to:

- Have the children try to verbalize how they remember facts.
- Build on to these strategies or help children modify them if necessary.
- Where children are unable to verbalize strategies or do not appear to have developed adequate strategies, help them to select those best suited to their needs and modify where necessary. Remember to consider both learning strengths and weaknesses when selecting and/or modifying strategies.

It is important to be atuned to students' strengths as well as learning weaknesses when selecting or modifying strategies for learning the facts. The following ideas may prove helpful in this regard. Three modalities—auditory, visual, and kinesthetic/tactile—are addressed, as well as several specific difficulties that some students have.

Dealing with Auditory Learners:

1. Precede all actions and demonstrations with spoken instructions. Each step may comprise two parts:
    - Oral instructions only.
    - Oral instructions closely followed by visual stimulus, concrete manipulation or demonstration.

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[*] Margaret Toohey is Math Coordinator, Division of Special Education, Queensland, Australia.

2. Provide a verbal summary of each step.
3. Use key words to focus the child's attention, if necessary.
4. Remove extraneous visual stimuli.

Auditory emphasis may be provided through:

- Verbal prompts developed in each sample lesson. Modify to meet an individual's needs.

- Close. In reviewing a strategy, orally prompt children's responses for unknown facts. Example: "12 x 6 is a picture 2. . . that's the egg carton fact. 12 x 6 is . . . (12)." Now follow with: "12 x 6 is a picture 2 . . . that's the . . . egg carton fact . . . 2 x 6 equals . . . (12)."

- Verbalizing with the child. Sit by children as they complete a worksheet of facts. This worksheet should contain many known facts but repeatedly present the one or two troublesome facts on which you are working. Children work through the sheet. When the difficult fact is encountered, children say the fact aloud with the teacher. The teacher should take care to speak clearly into the children's dominant ear.

- Use of tape recorder or Language Master. Let children select facts which they find difficult and for which they need concrete aids. Let children listen to the tape and say the facts with the tape. Initially the fact problem, a strategy hint and answer are provided. Over time the hint and later the answer are deleted. Pauses are inserted so students can supply the hint or answer.

- Verbal hints. Stress the verbal prompt provided under the title in each of the sample lessons.

- Oral Patterning. After strategies have been developed, ask children to identify the strategy for a particular set of facts. Refer to sets of facts by "name": Picture 2s, Clock 5, Pattern 9s, and so on.

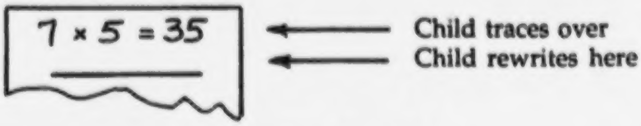
Dealing with Visual Learners:

1. Precede all oral instructions by concrete manipulations or mimed demonstrations. Each step may comprise two parts:
    - Presentation of visual stimulus only.
    - Visual presentation in conjunction with verbalization.
2. Have children describe the mimed or demonstrated action, pictures, or concrete manipulation, and identify the associated number fact.
3. Provide a visual summary of each step.

4. Encourage children to make mental images of visual stimulus. Provide opportunity for them to reproduce these images (verbal, pictorial).
5. Use cue cards to focus the children's attention.
6. Try a silent lesson.

Stress the visual presentation of facts, pictures, patterns and relationships in the sample lessons. Use these techniques:

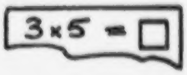
- **Write over:** (Plastic overlay for worksheet or cards is required.) The children place a worksheet or card under the plastic. They then trace over each number fact and rewrite it as suggested below.

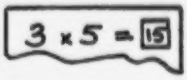
  Children may write facts on a blackboard.

- **Pleat the paper.** (Loose sheets of paper are required.)

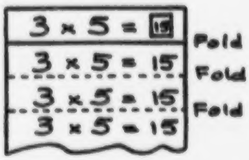
  1. The teacher writes the unknown fact without an answer at the top of the page.
  2. Children read the fact and tell the strategy to be used to get the answer. (Teacher can prompt children.)

  3. Children write the answer then trace over the fact and the answer, saying each aloud as they trace. They repeat until they know the fact.

  4. Children fold the paper down to hide the fact and rewrite as shown.
  5. Children open to check their answer.
     - If incorrect, return to step 1 or another activity to reteach an efficient method for memorizing the fact.
     - If correct, repeat the folding, writing, and checking until 3 consecutive correct answers are given.

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The purpose of the following activity is to help children to make mental images of the visual pictures. The following is one procedure that can be used.

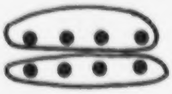
Stage 1.

- Study the picture (e.g., for Picture 2s, Clock 5s, Twice As Much, Break Apart facts.)
- Let your eyes be a camera and take a photograph.
- Close your eyes. The picture is on your eyelids.
- What can you see?
- What story (number facts) does the picture tell you?
- Say them.
- Write them.

When children are able to do this, move to Stage 2.

Stage 2.

- Read the fact (2 x 4).
- Close your eyes.
- Describe or draw the picture you can see for this fact.
- Complete the fact (2 x 4 = 8).



Dealing with Kinesthetic/Tactile Learners:

1. Precede all instructions by the physical manipulation of objects by the children. Teacher should guide all manipulations. Each step may comprise two parts:
    - Physical manipulation only.
    - Physical manipulation in conjunction with oral instructions.

2. Remove visual stimulus, if distracting. Have the children close their eyes, or place objects in their hands behind their back.

3. Provide a summary (physical manipulation of each step).

4. Use a cueing system to focus the children's attention.

5. Make use of textured material (pipe cleaners, sandpaper, plasticine), sandtrays and magnetic boards.

Stress techniques like the following. Each time or as needed, the appropriate verbal prompt can be given by the teacher or student.

- **Trace Over.** Children select one fact from those unknown. The teacher writes the fact in large numbers on a card saying the fact and its answer as it is written. The children then trace over the fact saying each part as it is traced. The children repeat the tracing until they feel they can say or write it without looking at the card. They close their eyes, write the fact in mid-air saying it as they go. (During this time the teacher writes the fact without the answer on the reverse side of the card.)

Select the next step according to children's learning needs.

- When children open their eyes let them immediately check their answer by referring to the answer side of the card. Then, reversing the card, have children copy and complete the fact on their pad. They could then check by turning over the card.

- When children open their eyes, direct them to write the fact and answer on their pad. They can check by referring to the answer side of the card.

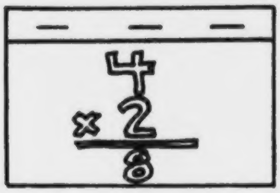
- When children open their eyes, they should copy and complete the unfinished fact. They can check by referring to the answer side of the card.

  Repeat the procedure for other facts being careful to work on 2 or 3 unknown facts in a session. Cards could then be stored in an envelope for re-use in Speed Up activities described in the sample lessons. They could also be used for review at the beginning of the daily lesson. If, during this review, children hesitate in answering, repeat Trace Over.

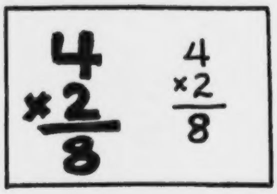
- **Ghosting.** Write the unknown fact with answer in large print on the blackboard. Have children trace over the fact with their finger saying each part aloud. Repeat the tracing until the "ghost" of the fact remains (until the chalk has been rubbed out).

  Variation: (For children with visual deficits)—Have children close their eyes while the teacher guides their hands in tracing the fact.

- **Stencil In.** (Cut out cardboard stencils of unknown facts—not duplicating masters.) Using the stencil children "write" the fact with a finger, saying each part aloud. Children can then use a crayon to fill in each part of the fact. Lifting the stencil, children can then rewrite the fact beside the colored one.



Stencil is stapled to a piece of paper.



- **Sand Trace.** (A sand tray, baking dish and sand will be required.) The children copy the number fact in the sand, saying each part aloud.

  Alternative: Place the card with the unknown fact in the tray and sprinkle lightly with sand. Have children trace over the fact saying ing it aloud as they do so.

- **3-D Write Along.** (String, dried glue or glitter over glue, sandpaper or other textured number fact cards will be required.) Have children finger-trace over the unknown fact, saying it aloud before writing it.

- **Finger-Trace.** (Number fact cards with the fact and answer on one side, fact only on the reverse side will be required.) Children finger-trace and say the fact with the answer. Then reversing the card they read the fact and give the answer immediately. The fact could then be written.

  Alternative: After tracing, children could close their eyes to PICTURE the fact in their mind as they write it in mid-air. While writing, children should say the fact with the answer. After opening their eyes and checking, they could reverse the card as above.

Sometimes it is necessary to tailor instructions to help children with specific learning difficulties. Ideas like the following may be useful.

Dealing with Students Having Receptive Language Difficulties

1. Present activities as given but break instruction into smaller units.
2. Exaggerate key words, phrases, and pause before or after key words are used.
3. Use pictures, gestures, concrete manipulations and written material to supplement the words. Match to children's needs and preferences. Draw on suggestions for visual and kinesthetic/tactile learners.
4. In severe cases, some use may be made of the deaf sign and cueing system.
5. Present the verbal prompts for each strategy in written form. Break into meaningful units (phrases).
6. Modify worksheets accordingly.

Dealing with Students Having Expansive Language Difficulties

1. Follow activities as outlined. When oral responses are required, accept the children's modified versions as interim measures.
2. Allow sufficient time for the children to express ideas (e.g., 10-second wait periods). Accept breaks in responses. Monitor carefully; do not rush the children.
3. Avoid speaking for the children.
4. Accept the children's use of aids to supplement their attempts to exhibit meaning: concrete manipulations, gestures, mime, and drawings.
5. Accept key words combined with actions for repeating or interpreting the verbal prompts highlighted beneath the title of each sample lesson in this resource.
6. Modify worksheets. Require less (but be selective!). Place answer digits randomly along page margins or tape these to a place clearly visible from the children's working area. Alternately, post a number chart or hundreds chart on the wall to which the children can refer.

Dealing with Students Having Abstract Reasoning Difficulties

1. Present activities as given. Stress the actions and use of pictures, (e.g., for 2s and 5s) and other visual aids (e.g., real objects instead of just pictures; demonstration clock.)
2. Try to ensure that the link between the words and actions has been made. Have the children describe the action as it is carried out.
3. Have the children carry out any manipulations of concrete materials.
4. Use pictures to supplement written symbols. Stress, and where necessary, modify the use of cards and aids.
5. Kinesthetic/tactile strategies are sometimes appropriate. Draw on ideas for kinesthetic/tactile learners.

6. For the verbal prompts highlighted for each strategy, use a pictorial form OR a written sentence by the picture.
7. Modify worksheets to incorporate pictures, cards, and aids when possible.
8. Encourage the children personally to use pictures, cards, and aids as necessary when doing seatwork.

Summary Comments

Learning handicapped children frequently exhibit characteristics which suggest a problem related to a particular learning mode (e.g. auditory). In most cases the task should be presented, initially, in a mode that reflects the area of strength (e.g. visual) and not the area of difficulty. However, the mode in which the difficulty exists should not be overlooked but should be incorporated into the task in a later step.

The guidelines above present ideas which should help teachers to take advantage of children's auditory, visual, and kinesthetic strengths while focusing on the memorization of number facts. Though detailed variations have not been written for other areas of difficulty, they should be taken into account. For children with gross or fine motor skills, for example, one should be more selective in the choice of the concrete materials and teaching aids or cards that are used. Sometimes those children will have to watch teachers manipulate and predict or otherwise describe an outcome. Alternate means of recording may also need to be considered.

If children have visual perception difficulties, many suggestions for auditory and kinesthetic/tactile learners will be appropriate. These children also profit from color highlighting (as suggested in the section for visual learners). In severe cases it may be necessary to limit the number of problems or to rewrite worksheets to remove irrelevant visual stimuli and provide more room for each written response.

Thought needs to be given to the presentation of material and implementation of tasks to highly active children. Though no rigid rules can be laid down, it is generally agreed that stimulus material should be reduced to the minimum. Any materials (such as counters, paper, books, pencils, etc.) extraneous to the task at hand should be removed.

The needs of very lethargic children should not be overlooked. Care should be taken to ensure that children are physically and mentally involved in the task. In this case there is usually a need to make the materials stimulating.

The ideas presented above have proved most useful for helping children with special learning needs succeed in a number fact program in which the goal is fact memorization or mastery. Most of the ideas can be adapted to promote success for these children with other math topics and can extend into other curriculum areas as well.

Activities Using Mechanical Aids

Mechanical aids such as calculators, language masters and tape recorders cannot replace understanding but can be used to supplement activities and provide another medium of presenting the material. Though they should not be used exclusively, they do provide the opportunity for individual experience.

Calculators

Calculators should only be used when children have the necessary prerequisite skill and understanding to carry out the required task. This includes those skills and understanding related to the machine.

Ordinary calculators may be used in a number of ways:

- They can be used to check answers on worksheets. Children can be given the opportunity to find their own errors before the teacher works through the sheet with them.

- They can be used in a structured activity to convince children that, for basic facts, they are faster than a calculator. Children could complete two tasks that are similar, one without and the other with a calculator, and then compare the number of correct responses and the time taken.

- They can be used to generate a number of facts for comparison (Multiply to Check facts, Partners, Turnarounds).

Note: Calculators with larger keys or with an output tape should be used by children with motor problems.

Care must be taken to ensure that children use the calculator appropriately. To point this out to the students, the group can be divided so that some use the calculators and some do not. Times taken to complete specific tasks are then compared.

Language Master

A master set of facts can be developed according to the organization within this resource. Language Master cards could be color coded to match each specific set of facts: Picture 2, Pattern 9s, and so on. Color coding helps students find and return facts to their correct place easily.

Students can then use their own record keeping system to select facts for individual practice. If the system is set up, the children can go to the language master corner and practice when they have a few minutes to spare, or when they are waiting for the teacher to help them.

Other specific uses of the Language Master follow.

- Teacher tapes the fact 6 x 2 without the answer on the master track. Children record the completed fact 6 x 2 = 12 on the second track. They remove the card and check with the response or strategy hint written on the back. If correct, they go on to next fact. If incorrect, they record the correct answer and play it a few times. Children read the corrected fact with the tape.

  $\begin{array}{r} 6 \\ \times 2 \\ \hline 12 \end{array}$

- As above, but auditory stimulus only.

  6 x 2 = ☐

  Make cards as illustrated.

- Record fact on card with answer or strategy hint being recorded after the cut. Children play teacher's track. When the card stops, children respond. Children then push the card on to check their response against the teacher's. If appropriate, children's responses could be written. Children then record the completed fact on the second track.

  Stage 1: 6 x 2 .... = ☐

  Stage 2: 6 x 2 ... = ☐

  Stage 3: 6 x 2 = $\boxed{12}$

  Record the fact (master fact) and its answer on the tape. Allow the maximum space available before the answer is recorded. Produce a series of cards (three to five) and, each time, reduce the space before the answer is given. Children try to give the answer before the teacher's response. The completed fact is then recorded, by children, on the second track. As children become proficient at one stage, they move to the next.

Tape Recorder

A tape recorder can be used in similiar ways to a Language Master except:

- There is no visual stimulus is attached to the tape.
- Only one track is used.

Children can record answers to written work on tape. Incomplete facts can be recorded on tape at intervals appropriate to students' response speed. Students write responses or completed facts on paper. If it seems helpful, students can identify the strategy, record it, and write the fact in the appropriate column.

Clock 5 or Turnaround	Zero Fact	Squares
9 x 5 = 45	6 x 0 = 0	4 x 4 = 16
5 x 8 = 40	0 x 9 = 0	7 x 7 = 49

Students also could write each fact and a related fact (e.g., another in the same strategy set; a turnaround, a partner fact, a multiply to check fact.)

Children can record a set of facts, leaving a space before they give each answer. They then can play the tape and try to give the answer before the tape.

Incomplete facts are recorded. Children could be asked to complete only particular facts suggested by the teacher, for example, Break Apart Facts.

Speed Up Activities for Learning Disabled Students

Once children can complete facts using given strategies, they can be given experiences to speed up their responses. Speed-up activities should only be used when children know how to work out facts efficiently and accurately, but are slow arriving at the answer. (Care should be taken not to prematurely introduce children to speed-up activities.)

When introducing speed-up activities, wait time should be sufficient to allow children to respond with a correct response. When the baseline is established, the wait time should be gradually reduced until children can respond correctly within two or three seconds.

Children with motor or language problems should be given special consideration. For these students, speed-up activities could take a different form. For example, children with motor problems could build up speed through the auditory mode by using a tape recorder. These students can keep a record of the time taken to complete a set of facts and try to better their record in subsequent trials.

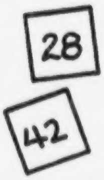
Sample Speed Up Activities (with modifications for special learning needs):

Mix and Match: Use flash cards. Mix and place them face down on the table. Children turn them over and match selected facts with answers, Pairs, Partners or Family Cards. The cards are checked for correctness.

Incorrect responses are noted for additional practice. The time taken is recorded—(28 correct in 3 minutes 30 seconds). At a later stage the task is repeated. Facts correct and time taken are compared to previous attempts. (This time 35 correct out of 40 in 2 minutes 40 seconds).

Beat Yourself: (A Tachistoscope, flashcards, or transparency for an overhead projector will be required.)

- Present each fact for a given time (to be reduced gradually to 2 or 3 seconds). Children give an oral response. As above, a record of numbers correct in the given time could be kept.
- *If children have expressive language difficulties, place cards with answers only randomly about the room. Children can be aided in expressing answers for any of the above activities by referring to the cards. As children become more confident, cards can be removed.*



Four Square: Prepare four small worksheets, each having 10 basic facts (no answers). The relative difficulty of the facts on each sheet should be similar. Give children one sheet at a time. Allow them 80 seconds to complete the first worksheet, 60 seconds for the second, 50 for the third, and 40 for the fourth.

REPEAT AT A DIFFERENT TIME. GRADUALLY REDUCE THE TIME TO THIRTY SECONDS.

Time Yourself: (A stopwatch and worksheet will be required). Ask children to estimate the length of time needed to complete a worksheet. Children complete the sheet and record the time shown. Using a master copy, children check the answers. Incorrect answers are circled for further practice. The teacher can help children to keep a record of the number correct and the time taken. Children should be encouraged to improve this record.

Five Up:

- Help children select five known facts.
- The teacher flicks through these flash cards, allowing 3 or 4 seconds for each answer.
- When children seem confident of these facts, replace one of the known facts with one that is troublesome to children.
- Repeat steps 2 and 3 as often as necessary to incorporate unknown facts.

THIS ACTIVITY COULD BE USED AT THE BEGINNING AND AT THE END OF A SESSION. REPEAT FOR SEVERAL SESSIONS.

Beat the Calculator: Many of the activities in the Calculator section can be modified to become Speed-Up activities.

Tape Recorder: The tape is one means of helping children with motor problems, build up speed with oral facts. The activities above (Beat Yourself, Time Yourself) could be modified for use on the tape.

Children could record completed facts on a tape at their own rate. Children can then replay the tape and try to give the answer before it is given on the tape. Such tapes could be shared by peers.

The teacher could prepare a tape with completed facts, with a pause between the fact and its answer. By building up a series of tapes or within one tape, the pause between the fact and answer could be shortened.

Management Strategies for Learning Disabled Students

A major purpose of ideas in this section is to help the teacher and children develop, modify and devise strategies to overcome attention difficulties associated with their learning problem. A structured, organized learning environment involving reasonable expectations and carry through is critical, as is suggested by the following.

Organizing Facts for Study

Create the following for each child:

- Individual Cross Out Sheets (see the Check Up section for details)
- A Number Facts Bank. This involves, for each student, a deck of facts written on cards. These cards would be stored in a box labeled "FACTS BANK." The box would be divided into THREE main sections:
  1. Facts I know well.
  2. Facts I can work out.
  3. Facts I do not know yet.

  Each of these sections could be subdivided to organize the facts according to their strategy (Pattern 9's, Clock 5's. . .).

  Such a Bank provides:

  1. A storage place for known facts (to see the number of known facts increase is motivating for children).

2. A set of know facts which the teacher can draw from when preparing individual activities and worksheets.

3. A means for checking long term memory. Children enjoy emptying their banks from time to time to count the number of facts they know. To return the facts to the bank, the children must be able to provide the answers immediately. If the children hesitate on a fact, it is placed either in the teacher's file or with the other facts that the children are currently studying.

AS CHILDREN WORK THROUGH THE PROGRAM, CHANGES SHOULD BE MADE TO THE CROSS OUT SHEETS AND TO THE NUMBER FACTS BANK.

Using the Facts

Facts I know well. Knowledge of these facts should be reviewed periodically. The teacher could also draw on these facts for other mathematics activities in which the primary focus is not basic number facts.

Facts I can work out. Facts from this section should be used when designing activities to provide additional practice.

- Children could select from these cards when playing board games.

- If a Language Master is available, a set of number facts could be made and organized into sets (Clock Fives, Break Apart Facts, and so on). Children could then select cards for additional practice. They could undertake this activity if they finish an activity and the teacher is not available.

- Facts from this section could be used for further memorization activities. These should be tailored to meet individual learning needs. Verbal prompting, rhythmic work, tracing, and writing are options to be considered.

Facts I do not know. These facts could be used when preparing activities to reinforce existing strategies or to develop others which will lead to the efficient retrieval of the facts. Use ideas from the sample lessons to help children develop strategies for learning these facts.

Applying to Computation

In teacher-directed work, activities like the following can be used to prepare children to transfer their knowledge of basic facts to computation.

- Review the facts to be used in the computations before they are begun.
- Identify harder facts. Read the examples and have children identify a helpful strategy for remembering each.
- Learning disabled children commonly exhibit two difficulties related to the use of facts in computation.

(1) *Does not recall known fact* —When presented with new or unfamiliar computation procedures, learning disabled children frequently "go blank" and cannot recall facts already know. The problem is one of transfer to the new situation.

Teachers can help by using examples that contain easy facts whenever new work is presented. These facts are more established and are less likely to cause problems. For similar reasons teachers could use examples with easy facts when testing newly learned skills or procedures in other mathematics areas, such as computation and measurement.

Strategies for independent work include:

- Having children quietly say the fact as they work. Saying the fact aloud often stimulates recall.
- Having children finger-trace the fact as it is said.
- Having children write as the side the fact causing difficulty. Seeing it in isolation often triggers recall.

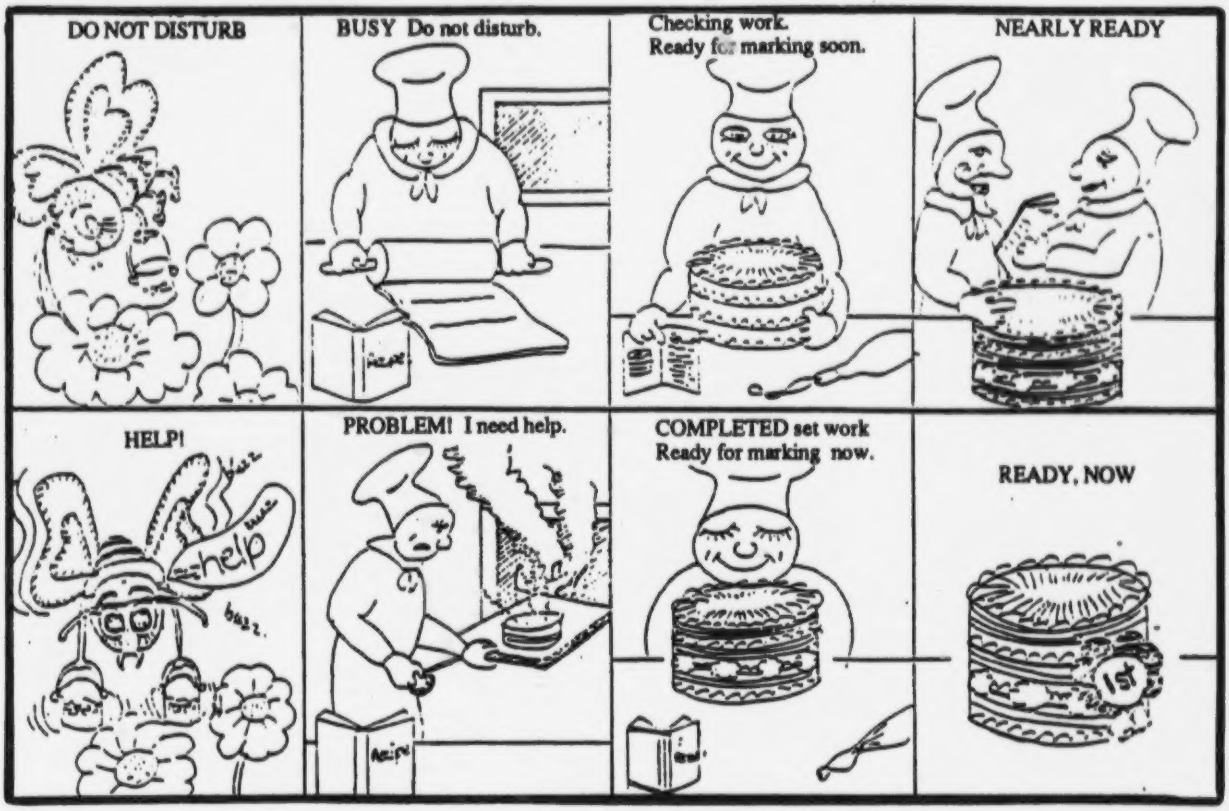
(2) *Does not know all of the facts.* Though all facts are not mastered, some children are ready to handle larger computations. These children could be tested individually. Help the children blacken completely all known facts on their worksheets. (A thick felt-tipped pen could be used.)

When children need help, they should refer to this sheet during mathematics lessons. Relevant sections of the sheet can be glued onto both sides of cardboard to make a book mark for their mathematics pad. As additional facts are mastered, they should be blackened so children do not become dependent on the sheet for known facts.

Self Management

Message cards can be used to help students focus and maintain attention on the task at hand. A sample set of message cards is given below. The students and the teacher can work together to develop cards that will best fit a situation.

- Message cards:


DO NOT DISTURB
BUSY Do not disturb.
Checking work.
Ready for marking soon.
NEARLY READY
HELP!
help
buzz
buzz
PROBLEM! I need help.
COMPLETED set work
Ready for marking now.
READY, NOW
1st

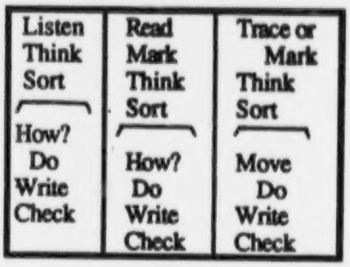
The purpose of these cards is to help very active or easily distracted students to stay seated and to remain on task. They should only be introduced when the child's concentration span is of sufficient length (10 minutes) to make their use purposeful.

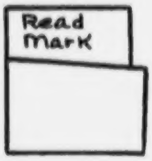
The students display the relevent sign as they work. When required, they change the sign and the teacher can go to them rather than having the children move about the room. However, care must be taken to provide children, particulary very active children, with legitimate reasons for moving about the room.

- Individual Work Cards

Learning disabled students frequently exhibit behavior of disorganization. These sample work cards have been designed to help students work through a particular task successfully. Initially, the teacher should work with students to modify the card and to modify a work card to fit the task at hand and to help students acquire the skills skills necessary to use them.

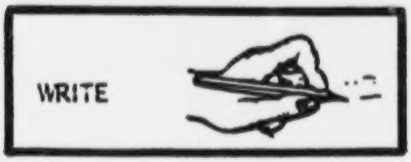
Individual work cards can provide focus on major strengths in specific modes and may require modification to fit the learning needs of individual children. Some students work best when the sequence on a work card is revealed step-by-step. In this case a cover sheet may be developed.

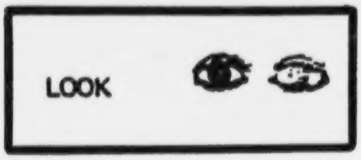

Listen
Think
Sort
How?
Do
Write
Check
Read
Mark
Think
Sort
How?
Do
Write
Check
Trace or
Mark
Think
Sort
Move
Do
Write
Check

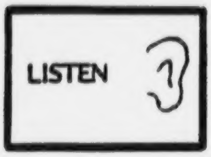


- Cue Cards

The cue cards below have been designed for use by the teacher as another means of focusing the childrens' attention. Instead of speaking, the teacher selects and shows a card to initiate a task. Some children who are confused by oral commmands respond well to this visual approach.







Record Keeping

Different approaches used by teachers to help students track progress toward number fact mastery are given below.

- Children build up a "Fact Bank" to keep a personal record of known and unknown facts. (See the previous section on Management.)

- Children build up a "dictionary" of facts to record known and difficult facts.

Facts are recorded under strategies (e.g., Picture 2s, Break Apart Facts, Zeros, Ones). Known facts are written in blue. Facts that children have had difficulty in remembering could be written in red. Related facts (turnaround, pairs, partners, families) are recorded as well as the relevent verbal prompt.

- Children glue a blank fact chart in front of a mathematics pad and write in facts as they are learned.

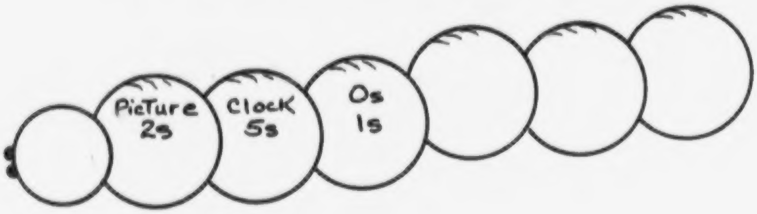
- Completed fact charts are glued in cardboard folders and known facts blackened for use with computation.

- Individual Cross Out sheets, described in the Check Up section are created.

- Teachers retain a copy of the fact chart in individual files as a personal record for each of the children. Instead of blackening in facts, dates could be recorded.

- Pictorial graphs, if relevant, could be created to map student progress.

- To assist motivation, "a fact worm" could be formed. As each set of facts is learned, it is recorded on a segment of the worm.



Home Involvement

The quality of home involvement and support varies from child to child. Many parents follow the school progress of their youngsters, and welcome the opportunity to stay abreast of what is happening. The area of basic facts is one important area in which parents should be informed and updated, for they can provide useful support in helping their children master basic number facts.

A good first way to involve and inform parents is to discuss helpful strategies for learning multiplication and division facts at the first Back to School parent meeting or conference in early fall. Marking facts off a Class Cross Out Chart as you briefly describe each strategy is helpful. If your school does not schedule such an event, the letters at the end of this section may be used instead.

It may also be useful to send parents a few at a time, some of the Thinking Strategy Terms. The letters at the end of this section may help to do this.

As work with facts continues, you'll want especially to document the progress of children who are having most difficulty. Keep individual Cross Out sheets for these pupils (p. 26) or save samples of their work so these can be compared to the Class Cross Out Chart (p. 23) at parent conferences.

If children lag behind, it really is NOT very helpful just to say: "Terry needs to study division facts." Parents need to know specifically which facts should be studied first (a small number), how often, and how long you might expect them to study each day:

> **"Terry needs to study these facts." (List them.) I want him to study them for two minutes every night this week. Please show him how to set a timer or set up some other way to keep track of the time. If Terry needs help, the strategy we've been using to work them out is ...**

Unless parents are informed, they have nothing better to do than pull out flash cards at random. They may also have Terry study only when they happen to think about it or when there is extra time.

Some teachers send home "Cool Facts" for the refrigerator door. Others routinely send home card stock flash cards color coded to the strategy that now is being practiced in SPEED UP games, exercises and activities at school. Many teachers ask parents to validate time spent practicing the facts, as is suggested in the sample letters.

Sample Letters to Parents

(date)

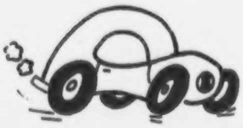
Dear Parents,

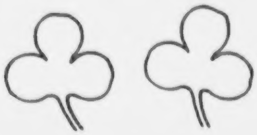
As we study multiplication number facts this year, we will try to keep you informed of some of the special clues used to help us remember the facts. This week we are learning the Picture 2s. Children are studying the following facts:

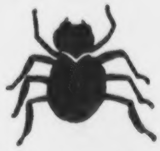
Picture 2s								Turnarounds of Picture 2s						
2	3	4	5	6	7	8	9	2	2	2	2	2	2	2
x2	x2	x2	x2	x2	x2	x2	x2	x3	x4	x5	x6	x7	x8	x9

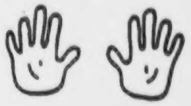
As you drill these facts with your child, please give this verbal prompt where needed: "See x2? Think of the picture." Below is a copy of the pictures we use for each fact.

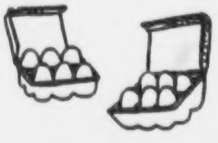
Thank you!
Ms. Anderson

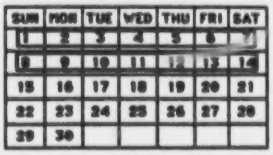

2×2 = 4

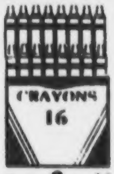

2×3 = 6

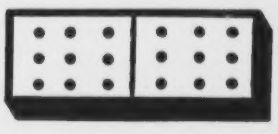

2×4 = 8


2×5 = 10


2×6 = 12


2×7 = 14


2×8 = 16


2×9 = 18

Dear Parents,

Please review the following multiplication facts with your child:

Clock 5s

1 2 3 4 5 6 7 8 9
x5 x5 x5 x5 x5 x5 x5 x5 x5

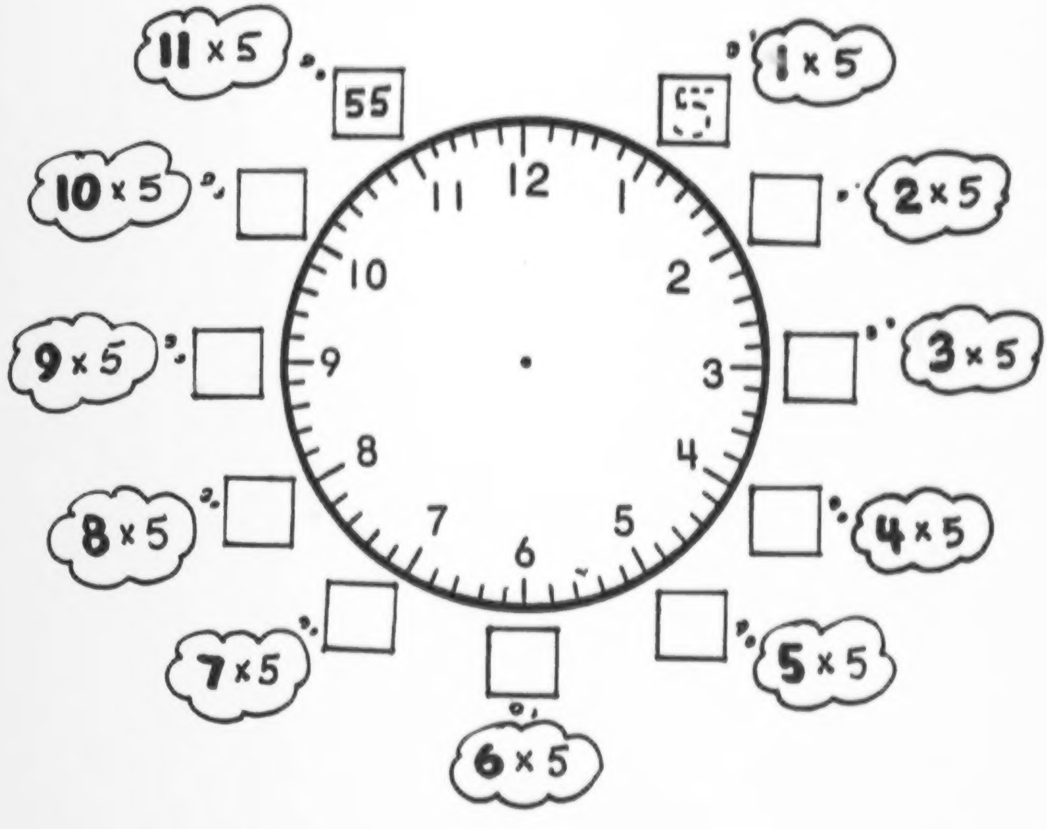
Turnarounds of Clock 5s

5 5 5 5 5 5 5 5 5
x1 x2 x3 x4 x5 x6 x7 x8 x9

As you practice these facts, please give the following hint as needed: "See x5? Think minutes after." We call these facts the Clock 5s because we can think "minutes after" on the clock to get the answer!

Thank you!
Ms. Anderson

Think: Minutes After



Dear Parents,

During the next two weeks we are studying basic facts. The facts your child should review/learn are given below. I am asking that these facts be studied for two minutes on any **five days** during the next week. Please return the following verification sheet on ________________. Just circle the days on which basic fact study took place. Thanks for your help!

Mrs. Thornton

I verify that ________________________ studied the following facts

for 2 minutes on each of the following days (circle) M T W R F SAT SUN

____
(Signature of parent/guardian)

Dear Parents,

During the next two weeks we are studying basic facts. The facts your child should review/learn are given below. I am asking that these facts be studied for two minutes on any **five days** during the next week. Please return the following verification sheet on ________________. Just circle the days on which basic fact study took place. Thanks for your help!

Mrs. Thornton

I verify that ________________________ studied the following facts

for 2 minutes on each of the following days (circle) M T W R F SAT SUN

____
(Signature of parent/guardian)

Please return on _______________.

I verify that _______________________ studied the following facts

for 2 minutes on each of the following days (circle) M T W R F SAT SUN

____
(Signature of parent/guardian)

Please return on _______________.

I verify that _______________________ studied the following facts

for 2 minutes on each of the following days (circle) M T W R F SAT SUN

____
(Signature of parent/guardian)

Please return on _______________.

I verify that _______________________ studied the following facts

for 2 minutes on each of the following days (circle) M T W R F SAT SUN

____
(Signature of parent/guardian)

Home Involvement: Game and Activity Ideas

Suggestions for Use by Teachers: Cut out the directions and clip or staple them to a copy of the related game sheet for students to take home. You also may want to send home a list of facts to be practiced. **These should be selected according to the strategies that have been developed.** For example, the Number Fact Wheel could be used for ÷2, ÷5, or ÷9 facts. After other division facts are mastered, the wheel can be used for review and to reinforce the "Multiply to Check" idea. You may want to tell parents the strategy hints you provide if children do not know facts in the list you provide. The sample letters to parents in the preceding section may provide ideas for doing this.

……

Try to Beat. (A "speed up" game for math fact practice.)

Use the attached sheet or simply number two columns 1 - 5 as shown. The name of the person playing with the child should be entered by the * at the top and bottom of the second column.

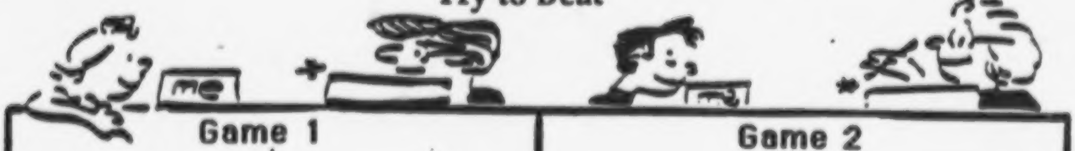
Select 5 number facts and study these with the child. Then one by one, show and read a fact aloud, and allow a short time (about 2 seconds) for the child to write the answer in the column headed "Me" on the sheet.

The child tries to write the correct answer before you give it. If the child can do this, the answer counts as 1 point in the column tally. If the child answers incorrectly or is unable to respond before you give the answer—then the child should write the problem and its answer in the second column, and whoever is playing with them gets 1 point in the column tally.

After the 5 facts have been called, add up the points in each column to see who wins the round. Play again! Keep the same facts if the extra practice is needed. Otherwise select different facts. See who wins 2 out of 3 rounds.

……

Try to Beat



Game 1		Game 2	
1.		1.	
2.		2	
3.		3.	
4.		4.	
5.		5.	
me ☐	* ☐	me ☐	* ☐

Game 3		Game 4	
1.		1.	
2		2.	
3.		3.	
4.		4.	
5.		5.	
me ☐	* ☐	me ☐	* ☐

Seven is Heaven (A "speed up" game for math fact practice.)

Give the child a copy of the "Seven is Heaven" score sheet.. Enter seven number facts on your copy of the score sheet to form a calling sheet. Call out the facts one at a time and have the child write the answers on the sheet. The length of time allowed to write an answer should gradually be decreased from one game to the next:

> Example: In the first game, allow up to 5 seconds for each answer; in the second allow 4 seconds for each fact; in third, 3 seconds; and in the fourth game, 2 seconds for each answer.

Use the same seven facts for each game, but present them in a different order each time. As the child becomes more sure, you might cut the response time to 4, then 3, 2 and 1 second(s) per fact for consecutive games.

A child's score in this game is found by:

- adding 1 to the number correct in Game 1;
- adding 2 to the number correct in Game 2;
- adding 3 to the number correct in Game 3;
- adding 4 to the number correct in Game 4;

and finding the total scores for the four games.

(Younger children may be permitted to use a calculator to find this total.)

Seven is Heaven

Game 1

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________

TOTAL ☐

Game 2

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________

TOTAL ☐

Game 3

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________

TOTAL ☐

Game 4

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________

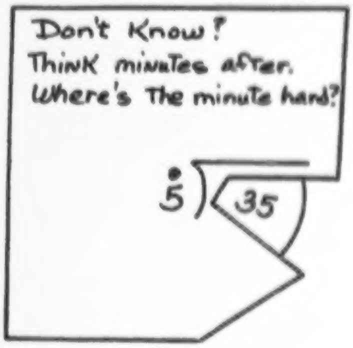
TOTAL ☐

Number Fact Wheel

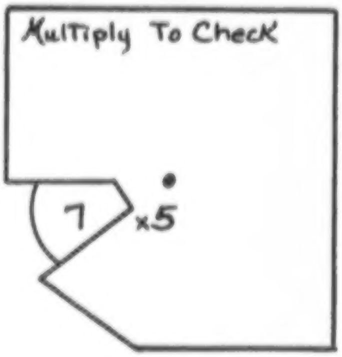
(A "speed up" game for math fact practice which also emphasizes the multiply to check idea.)

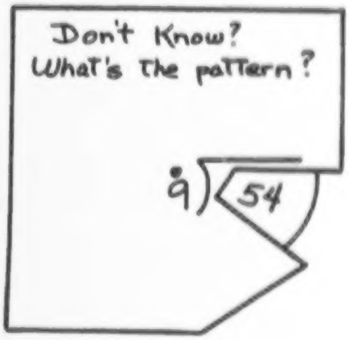
The child should first answer each division fact—then turn the wheel over and multiply to check. Keep track of the total number correct, or of the time taken to get back to the "green dot" starting point. Encourage the child to try to do even better the next time they play.

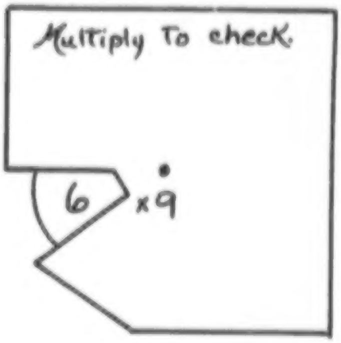
Front


Don't Know?
Think minutes after.
Where's the minute hand?
5)35

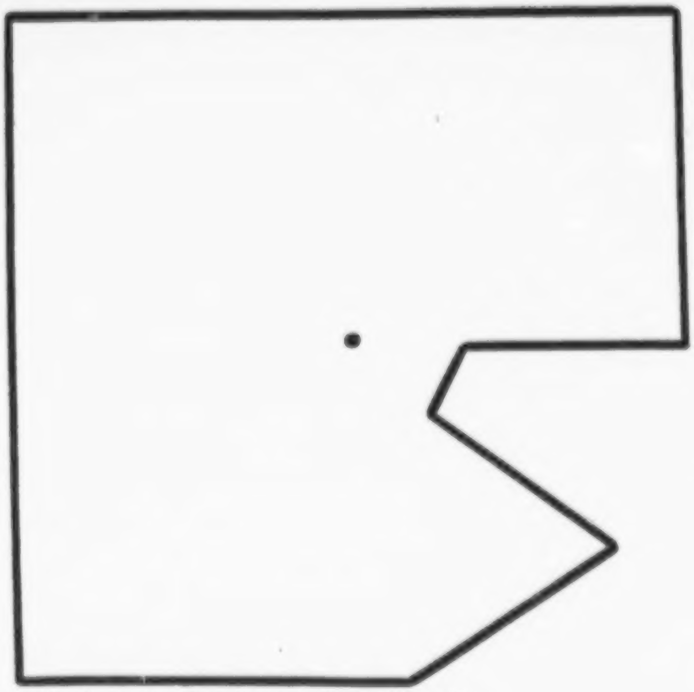
Back


Multiply To Check
7 ×5


Don't Know?
What's the pattern?
9)54

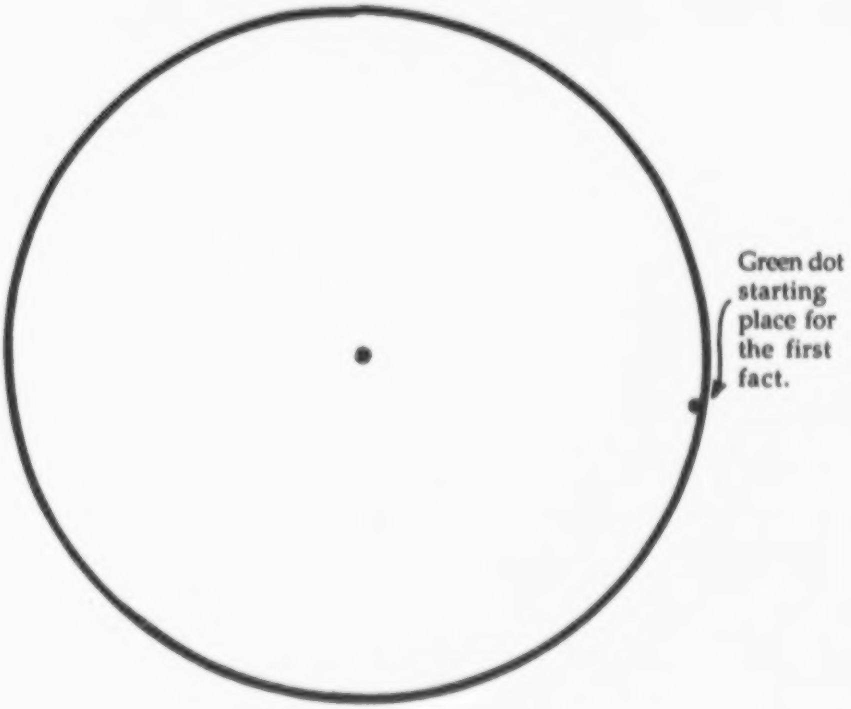

Multiply To check
6 ×9

Shaft



1. Cut shaft and wheel out of card stock.
2. Attach wheel inside shaft with a paper fastener.
3. Then write Division and Multiply-to-check facts on the wheel.

Inner Wheel


Green dot
starting
place for
the first
fact.

References

Baroody, A. J., "Mastery of Basic Number Combinations: Internalization of Relationships or Facts?" Journal for Research in Mathematics Education, 16 (March, 1985), 83-98.

Brownell, W. A. & Chazal, C. B. The effects of premature drill in third-grade arithmetic. Journal of Educational Research, 29 (1935), 17-28.

Case, R. Intellectual Development: Birth to Adulthood. Orlando, FL: Academic Press, Inc. (1985).

Cook, C. J. and Dossey, J. A. "Basic Fact Thinking Strategies for Multiplication —Revisited." Journal for Research in Mathematics Education, 13 (May, 1982), 163-71.

Leutzinger, L. P. and G. Nelson. "Counting With a Purpose," The Arithmetic Teacher, 27 (October, 1979), 6-9.

Rathmell, E. C. "Using Thinking Strategies to Teach the Basic Facts," in Developing Computational Skills, NCTM 1978 Yearbook, M.N. Suydam and R.E. Reys (Eds.). Reston, VA: National Council of Teachers of Mathematics, 1978, 13-38.

Swenson, E. J. "Organization and Generalization as factors in learning, transfer and retroactive inhibition." Learning Theory in School Situations. University of Minnesota Studies in Education, No. 2. Minneapolis, MN: University of Minnesota Press, 1949.

Thiele, C. L. The Contribution of Generalization to the Learning of Addition Facts. New York, NY: Bureau of Publications, Teachers' College, Columbia University, 1938.

Thornton, C. A. "Emphasizing Thinking Strategies in Basic Fact Instruction." Journal for Research in Mathematics Education, 9:3 (1978), 214-227.

Thornton, C. A. and C. Noxon. Look into the Facts: Addition and Subtraction; Look into the Facts: Multiplication and Division. Palo Alto, CA: Creative Publications, Inc., 1977.

Thornton, C. A. and P. J. Smith. (1988). "Action Research: Strategies for Learning Subtraction Facts." The Arithmetic Teacher, 35:8 (April, 1988), 8-12.

Thornton, C. A. and M. A. Toohey. "Subtraction Facts: Hide-and-Seek Cards Can Help," Teaching Exceptional Children, 19:1 (Fall, 1986), 10-14.

Thornton, C. A. and M. A. Toohey. "Basic Math Facts: Guidelines for Teaching and Learning," Learning Disabilities Focus, 1:1 (November, 1985), 44-57.

Thornton, C. A. and M. A. Toohey. Matter of Facts: Addition; Matter of Facts: Subtraction; Matter of Facts: Multiplication; Matter of Facts: Division—Teacher's Editions and pupil workbooks. Palo Alto, CA: Creative PUblications, Inc., 1984.

Appendix A:

Jiffy Quizzes

Fun Quiz
December

1. ________

2. ________

3. ________

4. ________

5. ________

6. ________

7. ________

8. ________

In all,

______ santa math facts!

Fun Quiz
January

1. ________

2. ________

3. ________

4. ________

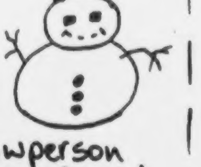
5. ________

6. ________

7. ________

8. ________

In all,



______ snowperson 174 math facts!

Fun Quiz
February

1. ________

2. ________

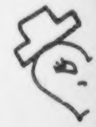
3. ________

4. ________

5. ________

6. ________

7. ________


8. ________

In all,

______ heart math fa

Fun Quiz

September

1. ________

2. ________

3. ________

4. ________

5. ________

6. ________

7. ________

8. ________

In all,

________ acorn math facts!

Fun Quiz

October

1. ________

2. ________

3. ________

4. ________

5. ________

6. ________

7. ________

8. ________

In all,

________ pumpkin math facts!

Fun Quiz

November

1. ________

2. ________

3. ________

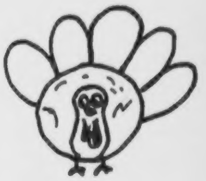
4. ________

5. ________

6. ________

7. ________

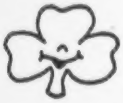
8. ________

In all,


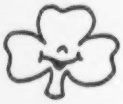
________ turkey math facts

Fun Quiz
March

1. ________



2. ________

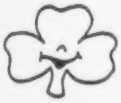


3. ________

4. ________

5. ________

6. ________



7. ________

8. ________

In all,

________ clover math facts!

Fun Quiz
April

1. ________

2. ________

3. ________

4. ________

5. ________

6. ________

7. ________

8. ________

In all,

________ umbrella math facts!

Fun Quiz
May

1. ________

2. ________

3. ________

4. ________

5. ________

6. ________

7. ________

8. ________

In all,

________ flower math fact

Jiffy Quiz

Name:____________________

8			4	7		6	
x__	x4	x2	x__	x__	x9	x__	x2
	2				5	6	
x6	x__	x3	x8	x4	x__	x__	x7

Name:________________________

			4	9			3
x3	x8	x9	x__	x__	x7	x6	x__
6		8			2	7	
x__	x2	x__	x9	x5	x__	x__	x4

Name:________________________

		9			7	9	4
x7	x4	x__	x8	x5	x__	x__	x__
	6		8		2		
x2	x__	x3	x__	x5	x__	x9	x6

Multiplication 2
Picture 2s

Jiffy Quiz

Name:____________________

4	3	2	2	8	9	2	5
x2	x2	x7	x6	x2	x2	x2	x2
2	2	7	2	2	2	6	2
x4	x3	x2	x5	x2	x9	x2	x8

Picture 2s

Name:____________________

2	2	4	6	2	3	8	5
x2	x7	x2	x2	x9	x2	x2	x2
2	2	2	2	9	2	8	7
x3	x8	x2	x6	x2	x4	x2	x2

Picture 2s, One a Week Facts

Name:____________________

8	5	7		2		2	2
x2	x2	x2	x__	x9	x__	x4	x6
7	2	9		6	2	3	2
x2	x2	x2	x__	x2	x7	x2	x8

Fill in missing problems with One a Week facts you are currently studying.

Jiffy Quiz

Name: ____________________

5		8	2	4	5	7	5
x6	x ___	x5	x6	x5	x9	x2	x3
2	5	8	2		2		5
x9	x7	x2	x5	x ___	x4	x ___	x5

Name: ____________________

2		8	2		5	9	5
x7	x ___	x5	x2	x ___	x6	x2	x9
8	7	2	3	2	4		5
x2	x5	x6	x5	x3	x5	x ___	x5

Name: ____________________

5	2		2	5	2	7	5
x6	x4	x ___	x8	x8	x7	x5	x2
2	9	4	9		5		3
x6	x5	x5	x2	x ___	x5	x ___	x5

Fill in missing problems with One a Week facts you are currently studying.

Multiplication 4
Picture 2s, Clock 5s,
Zeros, Ones, and
One a Week Facts

Jiffy Quiz

Name: ____________________

3 x5	2 x8	1 x6	2 x4	7 x5	0 x8	6 x2	___
4 x1	x__	5 x8	1 x1	2 x9	7 x0	9 x5	x__
7 x2	x__	0 x0	5 x2	___	5 x6	x__	1 x5

Name: ________________________

3 x0	5 x6	4 x1	x__	3 x5	8 x5	2 x3	2 x7
2 x2	6 x2	x__	4 x5	1 x9	2 x0	x__	5 x9
4 x2	7 x5	x__	5 x1	x__	5 x5	x__	0 x8

Fill in the missing problems with One a Week facts you are currently studying.

Multiplication 5
Picture 2s, Clock 5s,
Zeros, Ones, and
One a Week Facts

Jiffy Quiz

Name:__________________

0	8	7		6	2	4	7
x4	x2	x5	x	x2	x9	x5	x2
5	1		8	6	8	6	9
x5	x7	x	x5	x5	x1	x0	x5

Name:__________________

5	1	2	0	3		6	2
x8	x3	x5	x9	x5	x	x2	x1
2	7	5		5	4	5	2
x9	x5	x9	x	x0	x5	x6	x7

Name:__________________

3	7	2		5	1	8	
x5	x0	x2	x	x4	x6	x5	x
4	5	5	0	5	2	5	
x1	x7	x5	x8	x9	x8	x2	x

Fill in the missing problems with One a Week facts you are currently studying.

Jiffy Quiz

Name:________________

4 x9	8 x7	1 x9	9 x2	7 x9	4 x6	9 x5	7 x0
3 x5	9 x9	0 x1	9 x3	2 x4	7 x3	5 x2	9 x8
3 x4	6 x2	6 x6	7 x5	6 x9	5 x4	3 x3	5 x6

Name:____________________

8 x2	9 x9	8 x8	2 x9	6 x8	2 x7	9 x6	0 x8
7 x8	9 x7	4 x5	8 x9	4 x1	6 x5	5 x7	3 x9
6 x4	9 x4	3 x7	7 x6	5 x8	5 x5	5 x9	4 x3

Jiffy Quiz

Name:____________________

1 x8	8 x9	9 x3	9 x9	8 x6	3 x2	5 x0	9 x5
5 x3	2 x7	5 x8	7 x9	6 x4	2 x9	5 x5	4 x3
2 x6	8 x7	9 x6	2 x8	7 x6	9 x4	7 x5	3 x7

Name:________________________

4 x5	3 x9	4 x6	7 x8	6 x5	5 x9	6 x8	9 x9
9 x7	3 x4	5 x7	6 x6	8 x9	2 x9	0 x2	5 x8
3 x3	7 x3	8 x2	1 x7	6 x9	2 x7	2 x5	4 x9

Jiffy Quiz

Name:____________________

3	5	1	3	9	5	8	4
x3	x4	x6	x7	x7	x6	x7	x9
8	6	3	7	3	5	8	5
x5	x9	x9	x5	x4	x3	x8	x5
5	9	8	2	9	0	2	8
x9	x8	x2	x7	x9	x3	x4	x6

Name:________________________

3	1	9	2	3	7	5	6
x4	x0	x6	x9	x5	x9	x8	x7
5	6	5	6	4	8	2	5
x7	x8	x2	x6	x6	x9	x3	x5
3	7	9	2	5	9	2	9
x7	x8	x4	x6	x7	x3	x8	x9

Jiffy Quiz

Name: ____________________

7 x4	6 x9	7 x3	4 x4	2 x7	3 x9	6 x4	5 x9
4 x5	8 x4	3 x4	8 x8	4 x7	6 x7	6 x3	9 x0
1 x5	9 x7	4 x8	7 x5	3 x6	7 x8	3 x8	8 x6

Name: ____________________

9 x9	5 x3	8 x4	6 x5	8 x9	6 x3	3 x3	0 x4
1 x1	4 x4	8 x7	3 x8	2 x8	6 x7	3 x6	4 x8
6 x8	8 x3	6 x4	5 x5	3 x7	7 x4	5 x8	4 x9

Multiplication 10
Break Apart and
Easy Facts

Jiffy Quiz

Name:________________

4	7	3	7	3	8	9	6
x8	x5	x6	x8	x8	x6	x0	x3
4	6	8	4	8	4	5	6
x7	x7	x8	x3	x4	x5	x9	x4
3	2	4	7	6	7	1	9
x9	x9	x4	x3	x9	x4	x2	x7

Name:________________

5	3	7	5	4	1	4	3
x5	x7	x4	x8	x9	x2	x8	x6
6	2	8	4	3	0	3	6
x7	x6	x7	x4	x8	x0	x3	x5
8	6	8	5	9	6	8	6
x9	x3	x4	x3	x9	x4	x3	x8

Jiffy Quiz

Name: ____________________

8	6	9	8	3	9	9	3
x3	x4	x2	x4	x4	x4	x7	x6
9	6	3	6	3	2	4	5
x8	x7	x8	x0	x3	x8	x7	x9
4	6	8	7	4	6	1	4
x5	x3	x6	x4	x4	x9	x5	x8

Name: ____________________

4	3	4	7	4	5	6	9
x4	x7	x8	x8	x7	x8	x3	x6
3	7	8	5	2	6	8	7
x6	x9	x4	x5	x7	x6	x8	x4
4	8	5	3	3	6	3	6
x9	x3	x7	x5	x8	x2	x9	x5

Jiffy Quiz

Name:____________________

4	3	8	0	4	7	5	6
x6	x5	x3	x7	x7	x9	x8	x3
9	3	8	9	5	4	3	3
x9	x6	x2	x4	x4	x8	x3	x8
4	7	6	8	6	5	7	4
x3	x4	x8	x4	x9	x9	x8	x4

Name:____________________

7	3	1	4	6	9	8	4
x6	x8	x6	x4	x6	x6	x8	x7
5	7	3	7	8	7	3	9
x5	x4	x9	x9	x3	x2	x6	x2
8	5	6	7	4	8	9	5
x4	x6	x3	x3	x8	x5	x8	x7

Jiffy Quiz

Name:____________________

2	6	7	3	6	1	5	8
x7	x7	x5	x3	x2	x7	x4	x8
6	4	8	2	2	7	9	3
x8	x4	x9	x2	x8	x7	x6	x7
6	3	9	8	9	8	6	4
x6	x4	x9	x4	x2	x3	x3	x9

Name:_________________________

2	9	6	7	3	4	2	5
x4	x3	x6	x6	x5	x6	x3	x9
4	3	7	5	9	8	5	9
x7	x8	x8	x2	x8	x6	x5	x9
6	7	4	3	0	5	7	8
x9	x7	x8	x6	x4	x6	x9	x5

Jiffy Quiz

Name:________________________

8	5	1	6	3	7	6	2
x8	x4	x3	x2	x3	x5	x7	x7
7	9	7	4	2	8	4	6
x3	x6	x7	x7	x8	x9	x4	x8
4	6	8	9	8	7	9	6
x9	x3	x3	x2	x4	x8	x9	x6

Name:________________________

5	8	6	3	7	6	9	2
x9	x7	x4	x5	x6	x6	x3	x4
9	8	5	9	5	4	3	4
x9	x6	x5	x8	x2	x3	x8	x7
6	8	7	5	0	7	4	3
x9	x5	x9	x6	x8	x7	x8	x6

Jiffy Quiz

Name: ______________________

$2\overline{)14}$ $4\overline{)8}$ $2\overline{)12}$ $8\overline{)16}$ $5\overline{)10}$ $2\overline{)18}$ $3\overline{)6}$ $8\overline{)16}$

$9\overline{)18}$ $2\overline{)10}$ $2\overline{)16}$ $2\overline{)4}$ $6\overline{)12}$ $2\overline{)6}$ $7\overline{)14}$ $2\overline{)8}$

Name: ______________________

$2\overline{)4}$ $6\overline{)12}$ $2\overline{)6}$ $7\overline{)14}$ $2\overline{)8}$ $3\overline{)6}$ $2\overline{)18}$ $5\overline{)10}$

$8\overline{)16}$ $2\overline{)12}$ $4\overline{)8}$ $2\overline{)14}$ $9\overline{)18}$ $2\overline{)10}$ $2\overline{)16}$ $7\overline{)14}$

Name: ____________________

$5\overline{)10}$ $2\overline{)18}$ $2\overline{)6}$ $6\overline{)12}$ $3\overline{)6}$ $9\overline{)18}$ $2\overline{)8}$ $7\overline{)14}$

$2\overline{)12}$ $8\overline{)16}$ $2\overline{)4}$ $2\overline{)16}$ $4\overline{)8}$ $2\overline{)19}$ $2\overline{)14}$ $9\overline{)18}$

Jiffy Quiz

Name:________________________

$2\overline{)18}$ $7\overline{)14}$ $2\overline{)8}$ $5\overline{)10}$ $2\overline{)12}$ $9\overline{)18}$ $2\overline{)6}$ $2\overline{)14}$

$1\overline{)7}$ $2\overline{)10}$ $2\overline{)16}$ $3\overline{)6}$ $2\overline{)4}$ $7\overline{)14}$ $8\overline{)16}$ $4\overline{)8}$

Name:________________________

$2\overline{)10}$ $6\overline{)12}$ $2\overline{)16}$ $2\overline{)12}$ $5\overline{)10}$ $2\overline{)16}$ $3\overline{)6}$ $2\overline{)8}$

$7\overline{)14}$ $2\overline{)6}$ $8\overline{)16}$ $2\overline{)14}$ $9\overline{)18}$ $2\overline{)4}$ $4\overline{)8}$ $2\overline{)18}$

Name:________________________

$2\overline{)16}$ $5\overline{)10}$ $2\overline{)10}$ $6\overline{)12}$ $2\overline{)18}$ $2\overline{)14}$ $9\overline{)18}$ $3\overline{)6}$

$2\overline{)12}$ $7\overline{)14}$ $2\overline{)8}$ $8\overline{)16}$ $4\overline{)8}$ $2\overline{)4}$ $2\overline{)18}$ $2\overline{)6}$

Jiffy Quiz

Name:________________________

$5\overline{)10}$ $4\overline{)20}$ $2\overline{)10}$ $5\overline{)40}$ $2\overline{)8}$ $7\overline{)35}$ $5\overline{)20}$ $6\overline{)12}$

$2\overline{)4}$ $2\overline{)14}$ $5\overline{)35}$ $2\overline{)16}$ $6\overline{)30}$ $8\overline{)40}$ $9\overline{)45}$ $9\overline{)18}$

$5\overline{)15}$ $7\overline{)14}$ $9\overline{)45}$ $5\overline{)25}$ $8\overline{)16}$ $3\overline{)15}$ $2\overline{)18}$ $5\overline{)30}$

Name:________________________

$2\overline{)14}$ $5\overline{)15}$ $2\overline{)6}$ $5\overline{)45}$ $5\overline{)10}$ $5\overline{)35}$ $6\overline{)12}$ $5\overline{)40}$

$6\overline{)30}$ $8\overline{)40}$ $2\overline{)18}$ $5\overline{)30}$ $3\overline{)15}$ $7\overline{)14}$ $5\overline{)25}$ $2\overline{)12}$

$2\overline{)10}$ $7\overline{)35}$ $8\overline{)16}$ $4\overline{)20}$ $3\overline{)6}$ $9\overline{)45}$ $4\overline{)8}$ $5\overline{)20}$

Jiffy Quiz

Name:________________________

$5\overline{)35}$ $6\overline{)30}$ $9\overline{)18}$ $8\overline{)40}$ $5\overline{)15}$ $2\overline{)10}$ $5\overline{)30}$ $4\overline{)20}$

$2\overline{)16}$ $3\overline{)15}$ $5\overline{)25}$ $7\overline{)14}$ $5\overline{)10}$ $2\overline{)18}$ $9\overline{)45}$ $3\overline{)6}$

$4\overline{)8}$ $5\overline{)40}$ $7\overline{)35}$ $5\overline{)45}$ $6\overline{)12}$ $8\overline{)16}$ $5\overline{)20}$ $2\overline{)14}$

Name:______________________

$2\overline{)8}$ $5\overline{)40}$ $7\overline{)35}$ $2\overline{)14}$ $5\overline{)45}$ $4\overline{)8}$ $9\overline{)45}$ $2\overline{)12}$

$5\overline{)10}$ $6\overline{)30}$ $8\overline{)16}$ $5\overline{)35}$ $8\overline{)49}$ $2\overline{)16}$ $4\overline{)20}$ $5\overline{)15}$

$2\overline{)6}$ $5\overline{)20}$ $7\overline{)14}$ $5\overline{)25}$ $6\overline{)12}$ $2\overline{)18}$ $5\overline{)30}$ $3\overline{)15}$

Jiffy Quiz

Name:________________________

$5\overline{)20}$ $6\overline{)30}$ $9\overline{)0}$ $6\overline{)12}$ $6\overline{)12}$ $8\overline{)40}$ $1\overline{)6}$ $4\overline{)20}$

$8\overline{)16}$ $5\overline{)15}$ $8\overline{)8}$ $7\overline{)14}$ $1\overline{)3}$ $5\overline{)35}$ $3\overline{)15}$ $5\overline{)30}$

$1\overline{)0}$ $2\overline{)16}$ $6\overline{)30}$ $5\overline{)25}$ $3\overline{)6}$ $5\overline{)45}$ $2\overline{)18}$ $4\overline{)4}$

Name:________________________

$5\overline{)5}$ $2\overline{)18}$ $5\overline{)25}$ $6\overline{)30}$ $2\overline{)0}$ $9\overline{)45}$ $9\overline{)18}$ $5\overline{)35}$

$5\overline{)10}$ $4\overline{)20}$ $2\overline{)12}$ $7\overline{)14}$ $7\overline{)35}$ $4\overline{)8}$ $5\overline{)40}$ $1\overline{)7}$

$8\overline{)16}$ $1\overline{)0}$ $5\overline{)30}$ $6\overline{)6}$ $8\overline{)40}$ $5\overline{)20}$ $3\overline{)15}$ $1\overline{)5}$

Division 6
Picture 2s, Clock 5s,
Zeros and Ones, 9s

Jiffy Quiz

Name:________________________

$2\overline{)12}$ $9\overline{)27}$ $5\overline{)40}$ $7\overline{)63}$ $2\overline{)0}$ $9\overline{)45}$ $3\overline{)27}$ $9\overline{)81}$

$5\overline{)45}$ $8\overline{)16}$ $1\overline{)3}$ $9\overline{)63}$ $4\overline{)36}$ $7\overline{)35}$ $9\overline{)36}$ $6\overline{)54}$

$8\overline{)72}$ $9\overline{)54}$ $4\overline{)20}$ $7\overline{)7}$ $9\overline{)18}$ $6\overline{)30}$ $9\overline{)72}$ $3\overline{)15}$

Name:____________________

$5\overline{)15}$ $9\overline{)54}$ $4\overline{)36}$ $5\overline{)40}$ $9\overline{)72}$ $4\overline{)0}$ $2\overline{)18}$ $9\overline{)63}$

$9\overline{)27}$ $5\overline{)25}$ $7\overline{)63}$ $8\overline{)40}$ $3\overline{)27}$ $5\overline{)45}$ $6\overline{)30}$ $9\overline{)81}$

$9\overline{)45}$ $6\overline{)6}$ $7\overline{)35}$ $8\overline{)72}$ $1\overline{)9}$ $6\overline{)54}$ $4\overline{)20}$ $9\overline{)36}$

Jiffy Quiz

Name:______________________

$5\overline{)35}$ $7\overline{)7}$ $3\overline{)27}$ $8\overline{)72}$ $4\overline{)36}$ $5\overline{)25}$ $9\overline{)81}$ $9\overline{)0}$

$6\overline{)54}$ $8\overline{)8}$ $5\overline{)40}$ $3\overline{)15}$ $4\overline{)8}$ $6\overline{)0}$ $9\overline{)45}$ $1\overline{)6}$

$7\overline{)63}$ $2\overline{)18}$ $7\overline{)35}$ $9\overline{)63}$ $1\overline{)2}$ $4\overline{)20}$ $7\overline{)14}$ $2\overline{)16}$

Name:______________________

$9\overline{)9}$ $9\overline{)45}$ $8\overline{)40}$ $6\overline{)54}$ $9\overline{)72}$ $4\overline{)0}$ $6\overline{)30}$ $9\overline{)36}$

$1\overline{)8}$ $9\overline{)54}$ $5\overline{)20}$ $2\overline{)8}$ $7\overline{)63}$ $6\overline{)12}$ $5\overline{)45}$ $2\overline{)10}$

$3\overline{)27}$ $2\overline{)18}$ $4\overline{)4}$ $7\overline{)35}$ $1\overline{)0}$ $2\overline{)12}$ $4\overline{)36}$ $3\overline{)6}$

Jiffy Quiz

Name:____________________

$9\overline{)36}$	$3\overline{)3}$	$9\overline{)27}$	$5\overline{)0}$	$5\overline{)15}$	$1\overline{)9}$	$5\overline{)40}$	$6\overline{)30}$
$1\overline{)8}$	$2\overline{)14}$	$9\overline{)45}$	$4\overline{)20}$	$7\overline{)35}$	$9\overline{)18}$	$7\overline{)63}$	$8\overline{)16}$
$5\overline{)25}$	$6\overline{)6}$	$6\overline{)12}$	$4\overline{)8}$	$8\overline{)72}$	$2\overline{)0}$	$9\overline{)54}$	$5\overline{)40}$

Name:____________________

$2\overline{)2}$	$2\overline{)10}$	$5\overline{)25}$	$3\overline{)15}$	$1\overline{)3}$	$2\overline{)18}$	$9\overline{)45}$	$8\overline{)0}$
$9\overline{)81}$	$7\overline{)35}$	$9\overline{)72}$	$5\overline{)30}$	$7\overline{)14}$	$3\overline{)0}$	$5\overline{)20}$	$9\overline{)63}$
$5\overline{)5}$	$3\overline{)27}$	$8\overline{)40}$	$6\overline{)54}$	$2\overline{)8}$	$4\overline{)36}$	$1\overline{)7}$	$5\overline{)45}$

Jiffy Quiz

Name:______________________

$5\overline{)10}$	$3\overline{)9}$	$9\overline{)27}$	$4\overline{)16}$	$1\overline{)4}$	$5\overline{)35}$	$2\overline{)16}$	$8\overline{)40}$
$8\overline{)64}$	$3\overline{)3}$	$6\overline{)36}$	$5\overline{)30}$	$7\overline{)63}$	$7\overline{)0}$	$5\overline{)25}$	$4\overline{)36}$
$9\overline{)81}$	$5\overline{)40}$	$4\overline{)8}$	$7\overline{)49}$	$5\overline{)45}$	$9\overline{)18}$	$6\overline{)54}$	$9\overline{)72}$

Name:______________________

$1\overline{)1}$	$3\overline{)6}$	$9\overline{)81}$	$2\overline{)14}$	$5\overline{)45}$	$7\overline{)7}$	$8\overline{)64}$	$5\overline{)35}$
$7\overline{)35}$	$4\overline{)16}$	$4\overline{)0}$	$8\overline{)72}$	$6\overline{)30}$	$5\overline{)25}$	$7\overline{)49}$	$1\overline{)8}$
$8\overline{)40}$	$9\overline{)54}$	$6\overline{)36}$	$3\overline{)9}$	$6\overline{)12}$	$6\overline{)18}$	$9\overline{)63}$	$3\overline{)27}$

Jiffy Quiz

Name:____________________

$5\overline{)10}$ $3\overline{)9}$ $9\overline{)27}$ $4\overline{)16}$ $1\overline{)4}$ $5\overline{)35}$ $2\overline{)16}$ $8\overline{)40}$

$8\overline{)64}$ $3\overline{)3}$ $6\overline{)36}$ $5\overline{)30}$ $7\overline{)63}$ $7\overline{)0}$ $5\overline{)25}$ $4\overline{)36}$

$9\overline{)81}$ $5\overline{)40}$ $4\overline{)8}$ $7\overline{)49}$ $5\overline{)45}$ $9\overline{)18}$ $6\overline{)53}$ $9\overline{)72}$

Name:____________________

$1\overline{)1}$ $3\overline{)6}$ $9\overline{)81}$ $2\overline{)14}$ $5\overline{)45}$ $7\overline{)7}$ $8\overline{)64}$ $5\overline{)35}$

$7\overline{)35}$ $4\overline{)16}$ $4\overline{)0}$ $8\overline{)72}$ $6\overline{)30}$ $5\overline{)25}$ $7\overline{)49}$ $1\overline{)8}$

$8\overline{)40}$ $9\overline{)54}$ $6\overline{)36}$ $3\overline{)9}$ $6\overline{)12}$ $6\overline{)18}$ $9\overline{)63}$ $3\overline{)27}$

Jiffy Quiz

Name:____________________

$7\overline{)28}$ $6\overline{)36}$ $4\overline{)16}$ $6\overline{)18}$ $8\overline{)56}$ $4\overline{)28}$ $6\overline{)24}$ $3\overline{)9}$

$8\overline{)32}$ $3\overline{)12}$ $8\overline{)48}$ $7\overline{)21}$ $4\overline{)24}$ $7\overline{)42}$ $3\overline{)21}$ $4\overline{)12}$

$8\overline{)24}$ $6\overline{)42}$ $4\overline{)32}$ $7\overline{)56}$ $6\overline{)48}$ $3\overline{)18}$ $7\overline{)49}$ $3\overline{)24}$

Name:____________________

$7\overline{)56}$ $9\overline{)81}$ $8\overline{)48}$ $4\overline{)32}$ $7\overline{)28}$ $6\overline{)42}$ $3\overline{)21}$ $3\overline{)24}$

$6\overline{)18}$ $3\overline{)12}$ $8\overline{)24}$ $8\overline{)56}$ $4\overline{)28}$ $7\overline{)49}$ $8\overline{)32}$ $6\overline{)48}$

$7\overline{)21}$ $4\overline{)12}$ $7\overline{)42}$ $3\overline{)18}$ $6\overline{)24}$ $8\overline{)64}$ $4\overline{)24}$ $6\overline{)36}$

Jiffy Quiz

Name:______________________

7)42 3)18 4)24 6)48 8)32 5)25 8)48 6)24

7)28 3)12 6)18 7)49 4)32 3)24 8)56 4)28

8)24 6)42 4)16 3)21 7)56 4)12 8)64 7)21

Name:______________________

4)12 6)24 7)28 3)24 9)81 8)64 6)42 7)56

4)32 8)48 3)21 6)48 3)18 4)24 7)42 4)16

8)56 4)28 8)32 6)18 7)21 8)24 3)12 7)49

Jiffy Quiz

Name: ____________________

$1\overline{)6}$ $3\overline{)24}$ $9\overline{)63}$ $8\overline{)56}$ $3\overline{)27}$ $7\overline{)42}$ $5\overline{)5}$ $6\overline{)24}$

$5\overline{)35}$ $7\overline{)21}$ $8\overline{)0}$ $7\overline{)14}$ $8\overline{)24}$ $6\overline{)30}$ $9\overline{)36}$ $3\overline{)21}$

$3\overline{)9}$ $7\overline{)63}$ $8\overline{)16}$ $4\overline{)28}$ $3\overline{)15}$ $7\overline{)49}$ $8\overline{)32}$ $5\overline{)10}$

Name: ____________________

$6\overline{)54}$ $1\overline{)0}$ $4\overline{)32}$ $7\overline{)56}$ $6\overline{)18}$ $5\overline{)30}$ $6\overline{)42}$ $5\overline{)20}$

$8\overline{)48}$ $4\overline{)16}$ $7\overline{)28}$ $6\overline{)12}$ $3\overline{)18}$ $4\overline{)4}$ $9\overline{)27}$ $8\overline{)64}$

$3\overline{)12}$ $4\overline{)12}$ $4\overline{)36}$ $4\overline{)24}$ $2\overline{)18}$ $7\overline{)14}$ $7\overline{)35}$ $6\overline{)48}$

Jiffy Quiz

Name:____________________

$7\overline{)42}$ $6\overline{)48}$ $2\overline{)16}$ $4\overline{)12}$ $4\overline{)20}$ $6\overline{)36}$ $8\overline{)72}$ $3\overline{)24}$

$8\overline{)48}$ $4\overline{)0}$ $3\overline{)18}$ $2\overline{)2}$ $9\overline{)45}$ $4\overline{)24}$ $5\overline{)40}$ $6\overline{)12}$

$3\overline{)9}$ $9\overline{)54}$ $1\overline{)7}$ $7\overline{)56}$ $7\overline{)21}$ $8\overline{)24}$ $7\overline{)49}$ $4\overline{)32}$

Name:____________________

$9\overline{)72}$ $2\overline{)0}$ $4\overline{)28}$ $5\overline{)45}$ $3\overline{)21}$ $8\overline{)64}$ $9\overline{)81}$ $4\overline{)16}$

$4\overline{)36}$ $8\overline{)40}$ $6\overline{)24}$ $5\overline{)15}$ $4\overline{)32}$ $3\overline{)12}$ $1\overline{)3}$ $8\overline{)56}$

$7\overline{)28}$ $6\overline{)18}$ $9\overline{)18}$ $7\overline{)49}$ $9\overline{)9}$ $2\overline{)10}$ $6\overline{)42}$ $5\overline{)25}$

Appendix B:

Useful Materials for Teaching Basic Facts

- Materials Needed in the Sample Lessons
- Individual Chalkboards: Alternatives to Consider

Materials Needed in the Sample Lessons
MULTIPLICATION

	Picture 2s	"One a Week"	Clock 5s	Pattern 9s	1s and 0s	Twice as Much Facts	Squares and the "Miner"	Notes
1. Flash Cards	✓	✓	✓	✓	✓	✓	✓	
2. Individual Chalkboards	✓	✓	✓	✓	✓	✓	✓	
3. Unifix cubes or other small counters				✓	✓			
4. Dice or spinners								*Could be used in many drill games*
5. Small cards/ notepaper (sometimes numbered)	✓	✓	✓	✓	✓	✓	✓	*Used as an alternate method of showing answers in activities*
6. Clock and Chalkboard			✓					
7. Pages from an old telephone book	✓	✓						
8. Calendar pages with the first day as Sunday		✓						
9. Graph paper		✓				✓	✓	
10. "Gold Party" snack in gold foil							✓	

Materials Needed in the Sample Lessons
DIVISION

	Picture 2s	Clock 5s	Pattern 9s	1s and 0s	Other Division Facts	Notes
1. Flash Cards	✓	✓	✓	✓	✓	
2. Individual Chalkboards	✓	✓	✓	✓	✓	
3. Unifix cubes or other small counters	✓				✓	*Useful in multiply to check work with small numbers*
4. Dice or spinners						*Could be used in many drill games*
5. Small cards/ notepaper (sometimes numbered)	✓	✓	✓	✓	✓	*Could be used as an alterrnate method of showing answers in activities*
6. Clock		✓				
7. Construction paper strips: seasonal colors			✓			

Individual Chalkboards

Alternatives to Consider

Many activities in the sample lessons of this teacher resource call for individual chalkboards. Teachers have found them most useful, for they can be used to structure activities so that ALL STUDENTS are required to think, then respond. Even students who look to a neighbor for a "hint" in answering are actively engaged in the learning situation! Getting students to think, write, and show responses on their chalkboard is a step above unison response or having students raise hands for one person to respond. The potential for children staying atuned to what is happening and actually staying on task is just increased.

School supply companies and many toy, drug, and grocery stores sell individual chalkboards. In addition, there are other options open to teachers for providing or substituting for commercial slates. These include:

- Using chalkboard paint (available at most hardware stores) on tagboard.
- Using chalkboard Contact® paper (available at many hardware, drug and department stores) on tagboard.
- Using china marker or crayons on plexiglass.
- Using commercial write and "lift up to erase" pads. These come with special writing sticks.
- Using cardboard backing sheets of writing pads. Just "season" the cardboard by rubbing chalk all over it, just as you would on a new chalkboard.
- Letting children just write big on their own notepaper. Teachers are close enough to the children that the writing will be visible.

However answers are provided, teachers can give or elicit from a student the correct response each time. This approach generally makes it unnecessary to single out an individual who may have shown an incorrect response. The main emphasis is promoting children's THINKING and active participation, and providing appropriate oral discussion and feedback.

Suggestions for Care and Storage

Chalkboards or slates, however provided, cost too much in time, money or effort to be mishandled. Still, they BELONG IN CHILDREN'S DESKS—not on a classroom shelf. If they are in the desks they are handy and will be used. If they are not, they tend to be too much trouble or take too much time to distribute at that odd, often unexpected moment when they could make a difference!

One suggestion is to have children pair up for storing. One child sandwiches and stores both chalkboards *slate sides together* to protect them; the other stores the chalk and wipe-off rag. Some teachers use washable rags or handiwipes and store chalk and rag in a ziploc bag. Others have children bring in light-colored socks (on which the chalk dust is not quite so visible and hence less distracting), and instruct children to drop their chalk into the sock before storing it in a ziploc bag. From time to time, the rags or socks can be collected and washed.

Appendix C:

Card Sets for the Basic Fact Program

- Using the Card Sets
- Card Sets

Using the Card Sets

Seven card sets are contained in this section:

- Picture 2 Cards (9 cards)
- Clock 5 Cards (9 cards)
- Super Star Multiplication Cards (6 Cards)
- Division/Multiply to Check Flash Cards (25 Cards)
- Finger Flash Card Pattern (1 Card)
- Square Centimeter Card Sample (1 Card)
- Blank Gamepath and Chance Card (2 Cards)

The card sets are introduced and used in the sample multiplication and division lessons contained in this resource. Full details for their use are contained in the lesson(s) in which they are used. The following comments summarize their use in teaching and learning basic multiplication and division number facts.

1. **Picture 2 Cards.** Use to develop mastery of multiplication or division 2s.

   If students are not familiar with the pictures from their work with addition-subtraction doubles, carry out activities which, in a "hands on" manner, meaningfully relate each picture to multiplying or dividing by 2. Show students a real egg carton and demonstrate the way a half dozen is split off: 2 sixes, 12. Show a calendar page on which the first of the month is a Sunday. Get them to circle the first two weeks: 2 sevens, 14.

   Show a box of 16-crayons. Note the 2 rows of eight, 16 in all. Associate 2 nines, 18 dots, with the double domino 9 configuration.

   - Use pictures only as needed to help with harder facts.
   - Introduce a few pictures a day rather than all on the same day.
   - Provide lots of "match" activities: picture to fact; and fact to picture—prior to drill for speed.

2. **Clock 5 Cards.** Use to develop mastery of multiplication or division 5s. Do not use the cards for multiplication until students can read a standard clock to the nearest 5 minutes: 2:20, 2:35, and so on.

   Skip counting is a slower solution strategy than associating 5s with "minutes after" on a standard clock. If students are skip counting, follow suggestions in the Clock 5s multiplication lesson to help them relate to minutes after on the standard clock.

   - Show times (nearest 5 minutes) on a large demonstration clock. Have students find or write the matching x5 fact.

   - Provide lots of "match" activities: clock picture to fact; and fact to picture—prior to drill for speed.

3. **Super Star Multiplication Cards.** These cards form small decks of playing cards to reinforce the multiplication strategies. Children follow the rules of three familiar card games:

   - Concentration: Match picture or hint to the fact and *say* answer; match fact to answer.

   - Super Star: Use "Old Maid" rules to make matches similar to those made in Concentration, using a Super Star card as the odd card with no mate.

   - Fish: Make "books:" picture or hint, fact, answer.
     Examples of books:

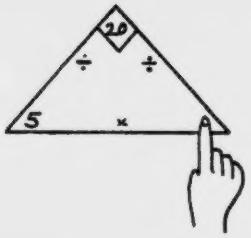
Book 1 (5 cards)	Book 2 (3 cards)
Hint card for 8 x 4.	7 x 7 fact card.
9 x 4 cards.	Clock picture card to match.
8 x 4 card.	35 answer cards.
32 answer cards.	

   Each time as books are laid out, the player should say the answer(s) to the number facts involved.

4. **Multiplication-Division Flash Cards.** These cards are used extensively throughout the lessons. In the division lessons, students say what they think is the division answer, then flip and use multiplication to check. The use of these cards, supported by other multiply to check activities in the Division lessons, is considered extremely useful for helping children

develop an understanding of and actually using the division-multiplication relationship in number fact work.

5. **Finger Flash Cards.** These cards are used to reinforce the division-multiplication relationship, as well as the relationship between related division like 20 ÷ 5 and 20 ÷ 4. They also can be used to reinforce the "family of facts" idea. The sample card may be used as a blackline master to create additional cards. The Multiply to Check, Partner, and Family activities in the Division lessons provide specific details on using the cards. One sample use is illustrated below.



20 ÷ 5 = 4

because 5 x 4 = 20.

(Lift finger to check.)

6. **Blank Gamepaths with Chance Cards.** Blank gamepaths are best used for practice, and are referenced in several multiplication and division Speed Up activities in the sample lessons of this resource. The following sample game directions illustrate how they might be used, at school or at home.

Sample Game Directions: Sea World

A Practice Game for Multiplication-Division Number Facts

Need: Sea World Gamepath and Chance Cards, cardboard spinner (see pattern below—child pokes pencil through center hole and spins like a top); game marker for each player, paper and pencil to tally points earned during play; deck of cards with facts needing practice. It is possible for each student to have a different deck of cards during play.

To Play (with 2-3 students):

1. Mix the chance cards and put them in a pile, face down on the gameboard. Then mix the fact cards and put them in a pile, face down. Put all game markers on **Start**.

2. Each player draws a card and tells the answer. Player with the highest answer goes first.

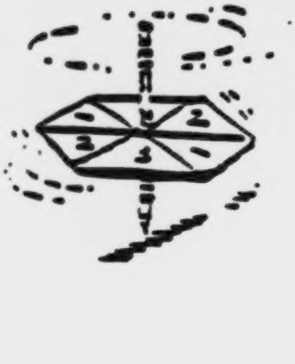
3. In turn, players draw a card and tell the answer. Use answer key or calculator to check when necessary.

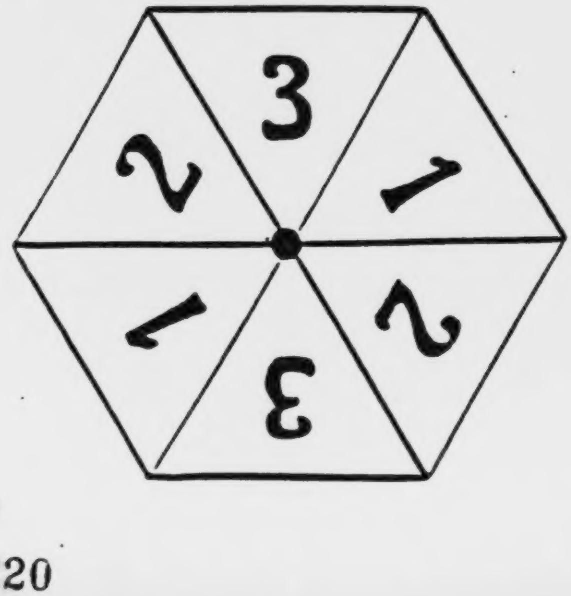
   *If wrong, take a "tread water." Move off the gamepath, just beside your space. Keep the card and study it. Give correct answer and get back on the gamepath at your next turn.

   *If correct, put card in the discard pile. Then spin and move that many spaces.

4. First to reach **Finish** wins the round. Mix the cards and play again.

5. Winner of game: Player who has won most rounds when time is called.



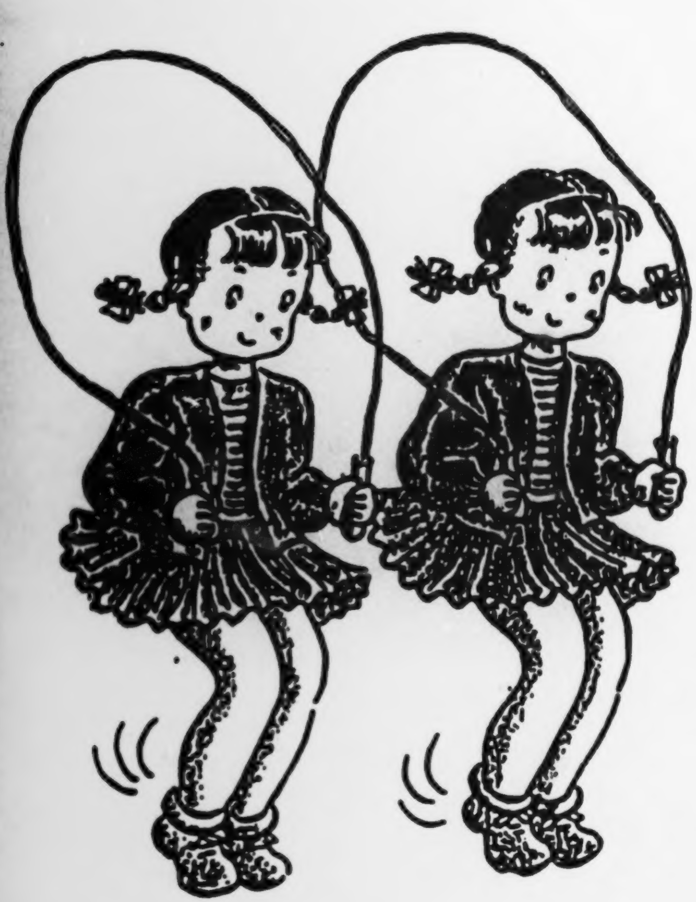


Cards for Picture 2's

Cut cards in half to create two sets:

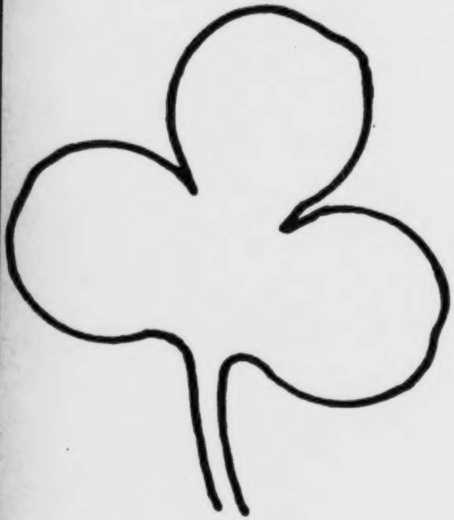
- Picture Cards,
- Number Fact Cards.

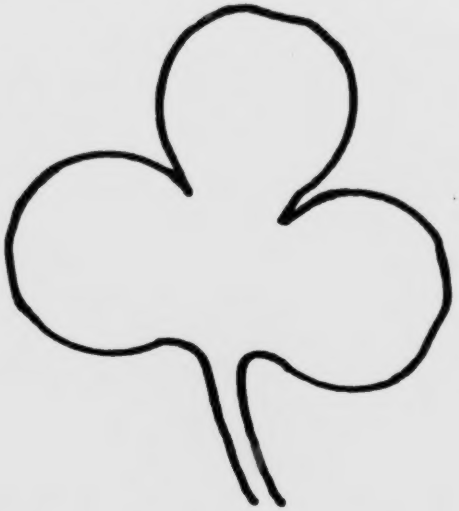
These cards are used in the lessons
for x2 and ÷2.



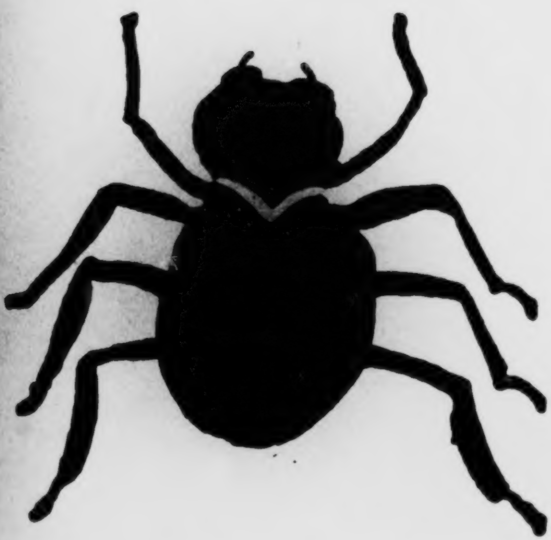
$$\begin{array}{r} 1 \\ \times\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \times\ 2 \\ \hline \end{array}$$

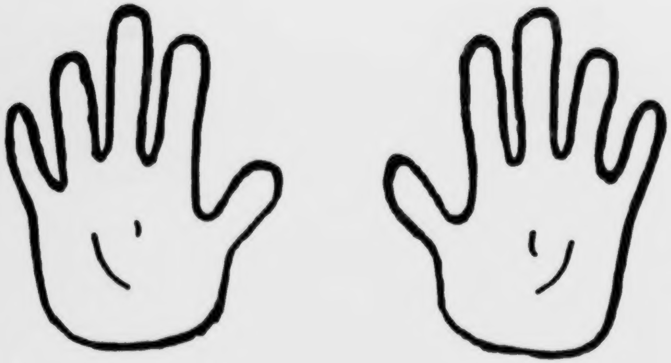




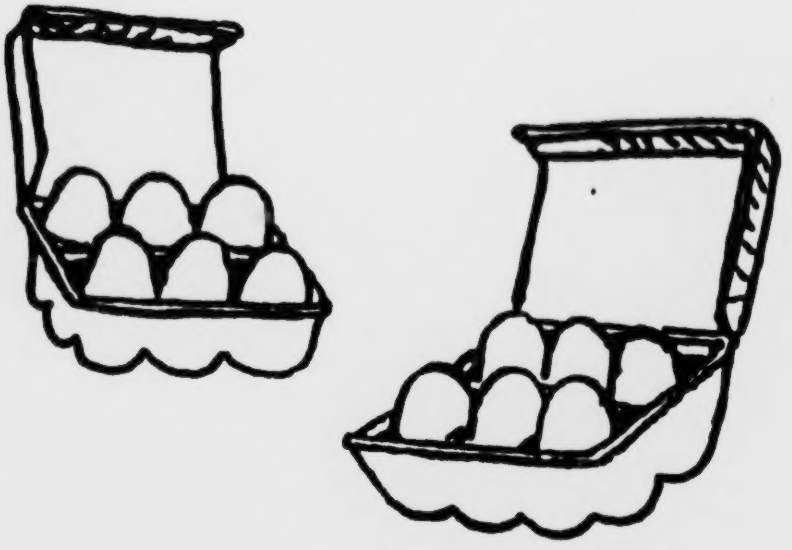
$$\begin{array}{r} 3 \\ \times\ 2 \\ \hline \end{array}$$



$$\begin{array}{r} 4 \\ \times\ 2 \\ \hline \end{array}$$



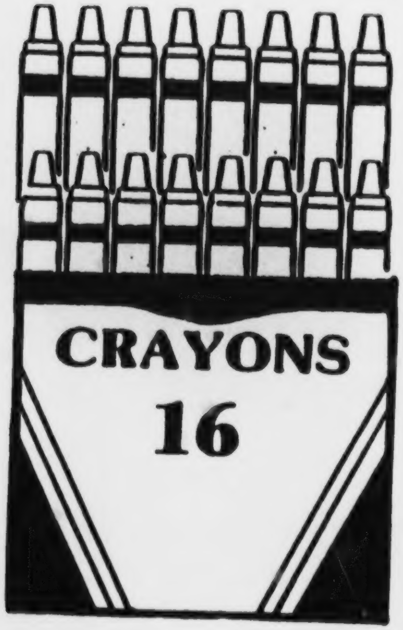
$$\begin{array}{r} 5 \\ \times\ 2 \\ \hline \end{array}$$



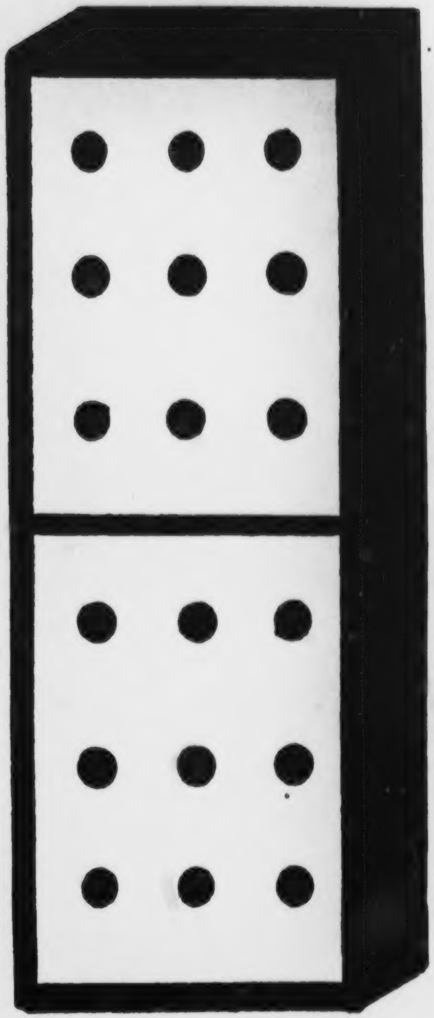
$$\begin{array}{r} 6 \\ \times\ 2 \\ \hline \end{array}$$

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

$$\begin{array}{r} 7 \\ \times\ 2 \\ \hline \end{array}$$



$$\begin{array}{r} 8 \\ \times\ 2 \\ \hline \end{array}$$



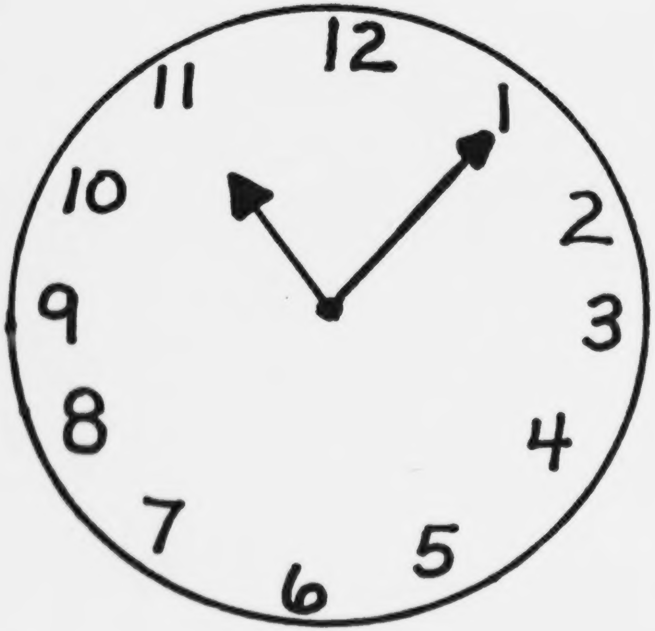
$$\begin{array}{r} 9 \\ \times\ 2 \\ \hline \end{array}$$

Cards for Clock 5's

Cut cards in half to create two sets:

- Picture Cards,
- Number Fact Cards.

These cards are used in the lessons for x5 and ÷5.


12
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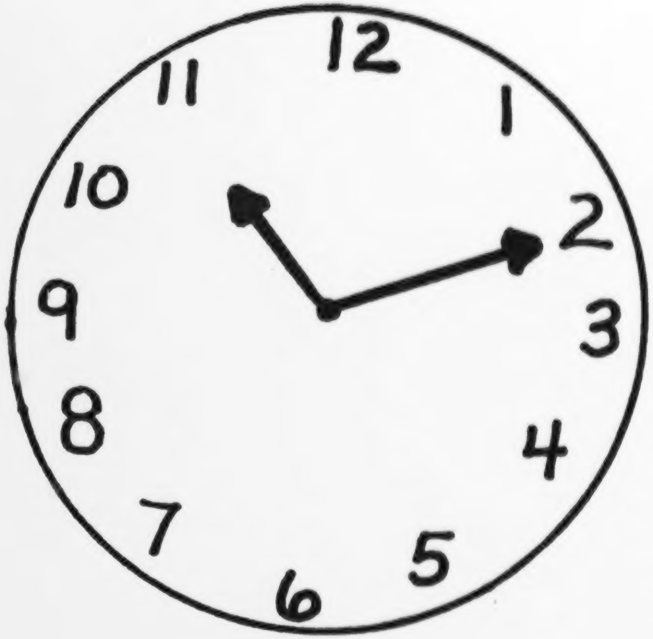
$$\begin{array}{r} 5 \\ \times\quad 1 \\ \hline \end{array}$$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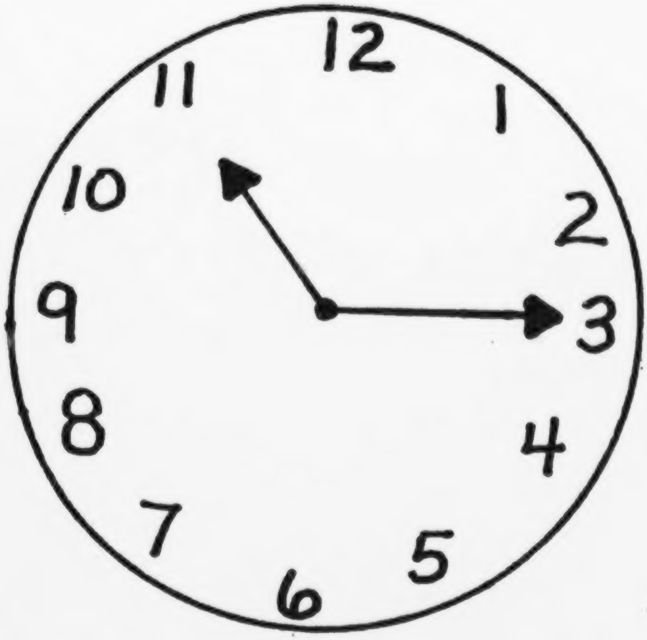
11

$$\begin{array}{r} 5 \\ \times\ 2 \\ \hline \end{array}$$


12
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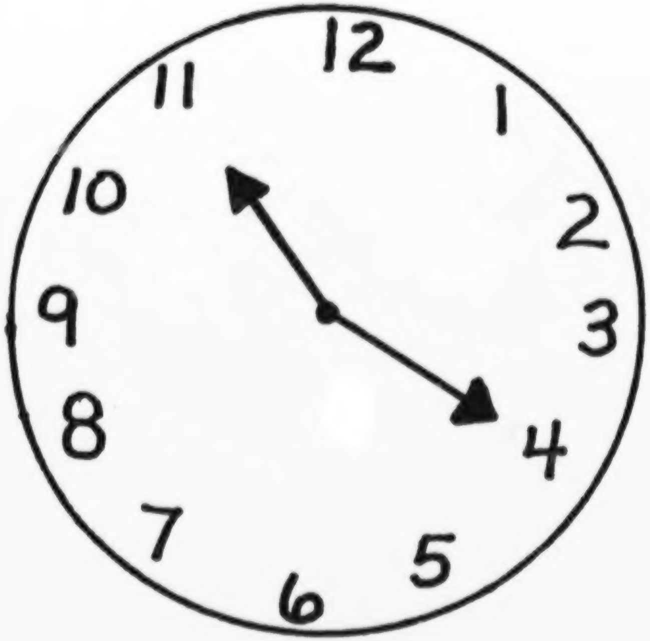
11

238

$$\begin{array}{r} 5 \\ \times\ 3 \\ \hline \end{array}$$

239


12
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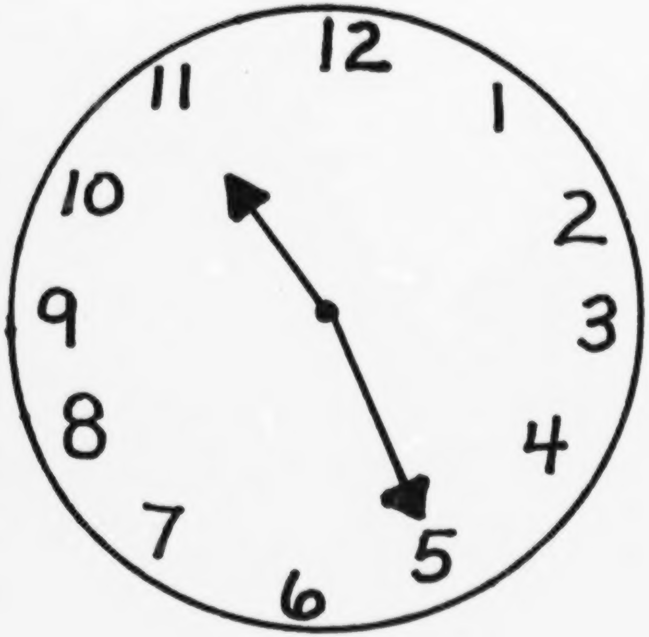
$$\begin{array}{r} 5 \\ \times\ 4 \\ \hline \end{array}$$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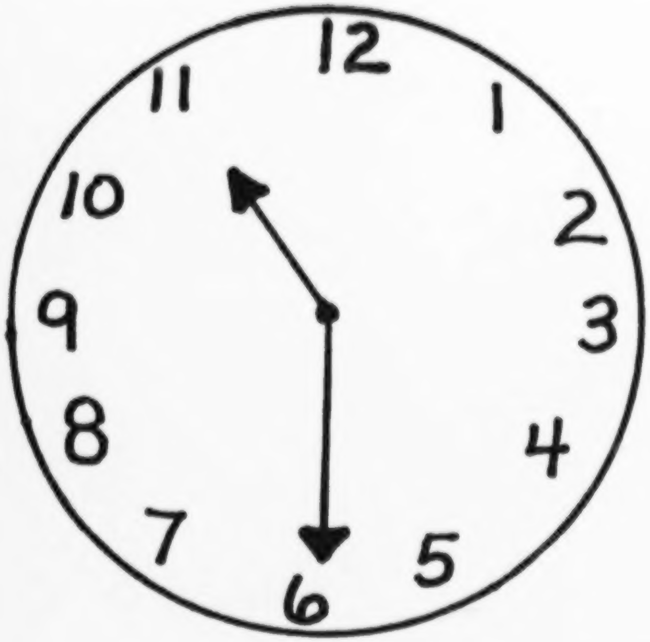
11

$$\begin{array}{r} 5 \\ \times\ 5 \\ \hline \end{array}$$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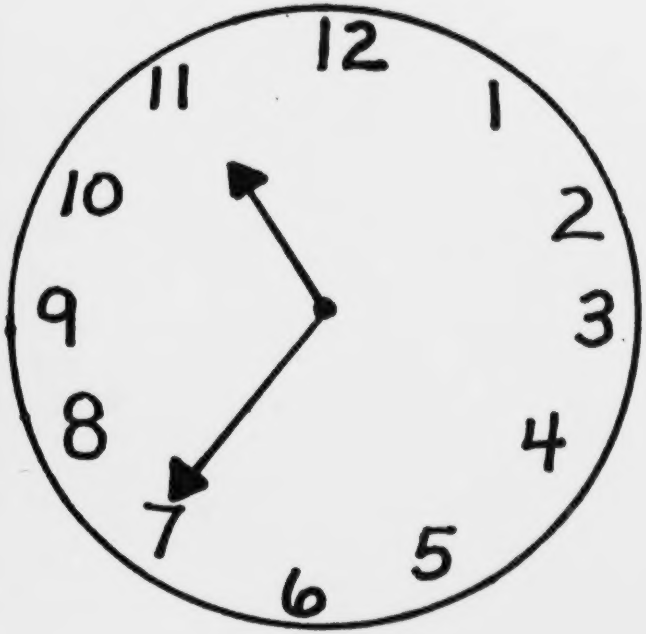
11

$$\begin{array}{r} 5 \\ \times\ 6 \\ \hline \end{array}$$



12
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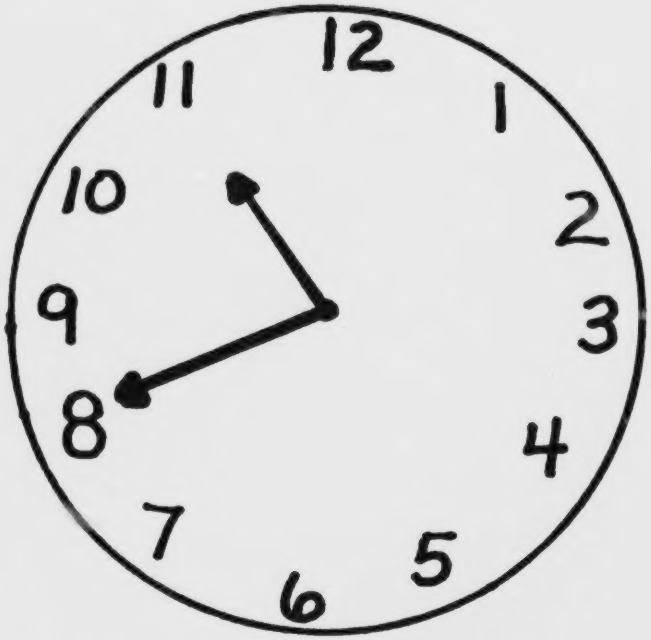
11

246

$$\begin{array}{r} 5 \\ \times\ 7 \\ \hline \end{array}$$

247


12
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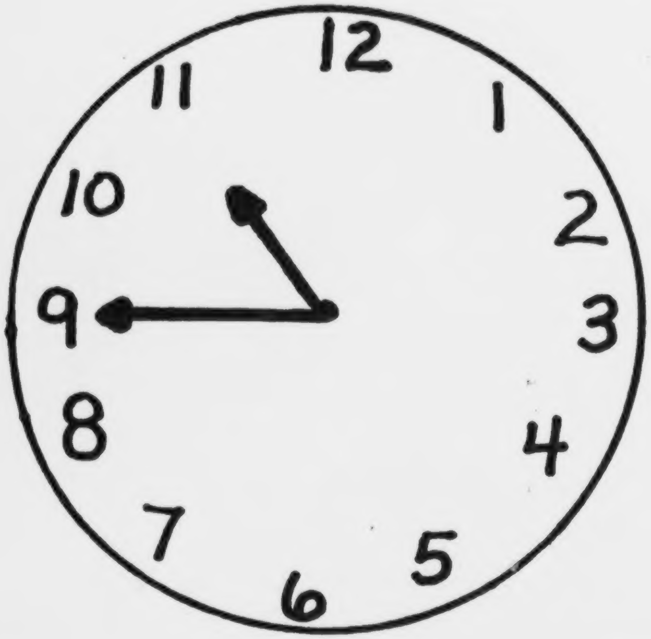
11

248

$$\begin{array}{r} 5 \\ \times\ 8 \\ \hline \end{array}$$

249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11

$$\begin{array}{r} 5 \\ \times\ 9 \\ \hline \end{array}$$

Super Star Multiplication Cards

Cut into playing cards for partner or small group activity.

Separate sets can be formed for:

Picture 2s
Pattern 9s

Clock 5s
One a Week Facts

Break Apart Facts

For each number fact card in each set, a picture or hint cards and matching answer cards are provided. Game play may involve one or more card sets.

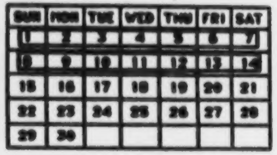
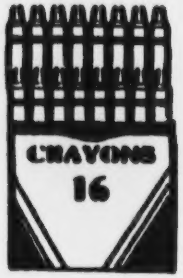
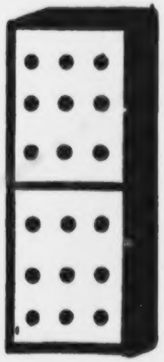
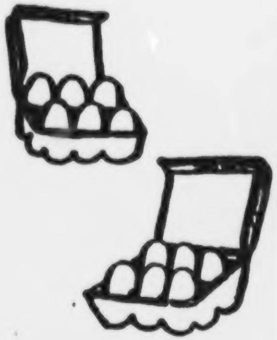
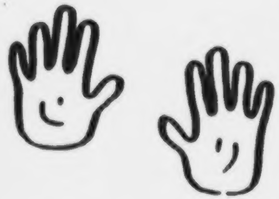
Three "familiar" games can be played:

- **Concentration**
  Match picture or hint card to fact and say answer; match fact to answer.

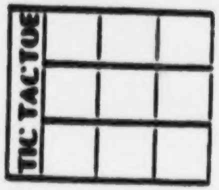
- **Super Star**
  Use "Old Maid" rules to make matches as in Concentration, using one Super Star card as the odd card with no mate.

- **Fish**
  Make "books:" picture or hint cards and matching answers. Each time, SAY the answer.

10	12	14

7 × 2	8 × 2	9 × 2	6 × 2	5 × 2
 SUN MON TUE WED THU FRI SAT				

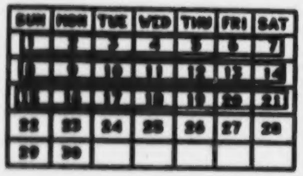
3
× 3



9

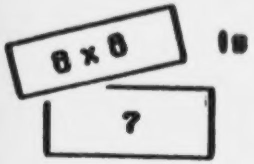
35

7
× 3


SUN
MON
TUE
WED
THU
FRI
SAT

21

4
× 6



Pick it up,
it's on the
floor!

8
× 8

64

They rhyme:

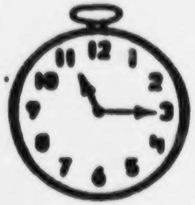
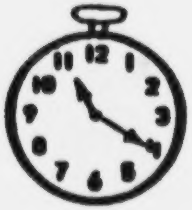
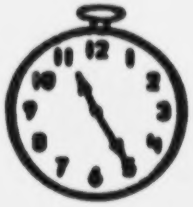
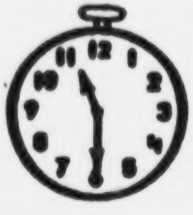
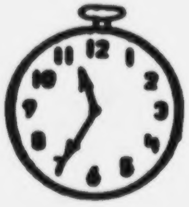
6 x 4 = 2__

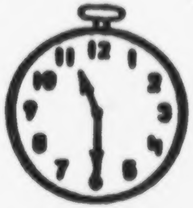
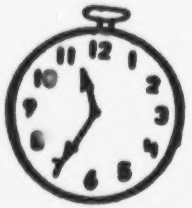
6 x 6 = 3__

6 x 8 = 4__

24

16	18	15

5×3	5×4	5×5	5×6	5×7
				
15 minutes after	20 minutes after	25 minutes after	30 minutes after	35 minutes after

	20	25	30	
35	 Super Star	$$\begin{array}{r} 5 \\ \times\ 8 \\ \hline \end{array}$$	$$\begin{array}{r} 5 \\ \times\ 9 \\ \hline \end{array}$$	6×7 Don't be blue. Turn me over, I'm...
40	45	 40 minutes after	 45 minutes after	$$\begin{array}{r} 7 \\ \times\ 6 \\ \hline \end{array}$$

Pattern can help.

$$\begin{array}{r} 3 \\ \times\ 9 \\ \hline \end{array}$$

27

$$\begin{array}{r} 4 \\ \times\ 9 \\ \hline \end{array}$$

36

Pattern can help.

$$\begin{array}{r} 6 \\ \times\ 9 \\ \hline \end{array}$$

54

Pattern can help.

$$\begin{array}{r} 7 \\ \times\ 9 \\ \hline \end{array}$$

63

Pattern can help.

$$\begin{array}{r} 8 \\ \times\ 9 \\ \hline \end{array}$$

72

Super Star

Pattern can help.

$$\begin{array}{r} 9 \\ \times\ 9 \\ \hline \end{array}$$

81

$$\begin{array}{r} 6 \\ \times\ 6 \\ \hline \end{array}$$

36

$$\begin{array}{r} 8 \\ \times\ 6 \\ \hline \end{array}$$

48

A "Grade" Fact:
Grade 1, then 2,
then 3 and 4.

3 x 4 = ___

4 x 3 = ___

$$\begin{array}{r} 3 \\ \times\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ \times\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \times\ 3 \\ \hline \end{array}$$

12

A "Grade" Fact:
Grade 5 then 6,
then 7 and 8.

7 x 8 = ___

8 x 7 = ___

$$\begin{array}{r} 7 \\ \times\ 8 \\ \hline \end{array} \qquad \begin{array}{r} 8 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ \times\ 7 \\ \hline \end{array}$$

56

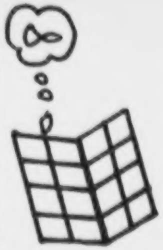
Gold
miner
fact

7 × 7

$$\begin{array}{r} 7 \\ \times\ 7 \\ \hline \end{array}$$

49

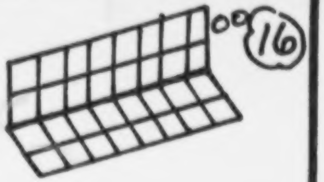
4
× 2



2 x 4 = 8
so
4 x 4 = __

4
× 4

8



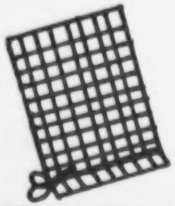
2 x 8 - 16
so
4 x 8 - ___

8
× 2

8
× 4

16

9 x 4 = 36
so
8 x 4 = __

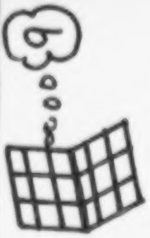


4
× 9

4
× 8

32

16



3 x 3 = 9

so

6 x 3 = __

$$\begin{array}{r} 3 \\ \times\ 6 \\ \hline \end{array}$$

18

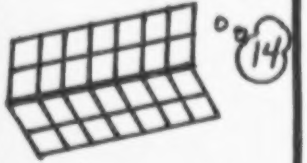
32

36

$$\begin{array}{r} 3 \\ \times\ 3 \\ \hline \end{array}$$

9

$$\begin{array}{r} 7 \\ \times\ 2 \\ \hline \end{array}$$



2 x 7 - 14

so

4 x 7 - ___

$$\begin{array}{r} 7 \\ \times\ 4 \\ \hline \end{array}$$

Super Star

14

28

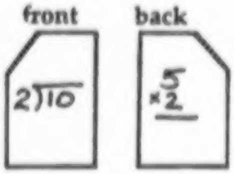
Multiplication-Division

Flash Cards

Cut each card to creaate four 2-sided number fact cards.

Notch cards as shown, for ease in telling when the division side of the card is "up."

These cards are used throughout the multiplication and division lessons.



Note: These cards may be packaged separately, but should also be sold as part of the Number Fact Resource.

$$\begin{array}{r} 0 \\ \times\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ \times\ 1 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ \times\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ \times\ 3 \\ \hline \end{array}$$

$1\overline{)\,0}$ $2\overline{)\,0}$

$3\overline{)\,0}$ $4\overline{)\,0}$

$$\begin{array}{r} 3 \\ \times\ 1 \\ \hline \end{array} \qquad \begin{array}{r} 2 \\ \times\ 1 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ \times\ 1 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ \times\ 1 \\ \hline \end{array}$$

$1\overline{)2}$ $1\overline{)3}$

$1\overline{)4}$ $1\overline{)5}$

$$\begin{array}{r} 7 \\ \times\, 1 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times\, 1 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ \times\, 1 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ \times\, 1 \\ \hline \end{array}$$

$1\overline{)\,6\quad}$ $1\overline{)\,7\quad}$

$1\overline{)\,8\quad}$ $1\overline{)\,9\quad}$

$$\begin{array}{r} 2 \\ \times\,2 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ \times\,2 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \times\,2 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ \times\,2 \\ \hline \end{array}$$

$2\overline{)\,2}$ $2\overline{)\,4}$

$2\overline{)\,6}$ $2\overline{)\,8}$

$$\begin{array}{r} 6 \\ \times 2 \\ \hline \end{array} \qquad \begin{array}{r} 5 \\ \times 2 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ \times 2 \\ \hline \end{array} \qquad \begin{array}{r} 7 \\ \times 2 \\ \hline \end{array}$$

$2\overline{)10}$ $2\overline{)12}$

$2\overline{)14}$ $2\overline{)16}$

$$\begin{array}{r} 1 \\ \times\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ \times\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ \times\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \times\ 3 \\ \hline \end{array}$$

$2\overline{)18}$ $3\overline{)3}$

$3\overline{)6}$ $3\overline{)9}$

$3\overline{)\,12}$ $3\overline{)\,15}$

$3\overline{)\,18}$ $3\overline{)\,21}$

$$\begin{array}{r} 5 \\ \times\ 3 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ \times\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ \times\ 3 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ \times\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ \times\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ \times\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \times\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ \times\ 4 \\ \hline \end{array}$$

$3\overline{)24}$ $3\overline{)27}$

$4\overline{)4}$ $4\overline{)8}$

$5\overline{)\,0}$ $6\overline{)\,0}$

$7\overline{)\,0}$ $8\overline{)\,0}$

$$\begin{array}{r} 0 \\ \times\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ \times\ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ \times\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ \times\ 7 \\ \hline \end{array}$$

Divide
by 0?
No!

Divide
by 0?
No!

Divide
by 0?
No!

$$1\overline{)\,1\,}$$

$$\begin{array}{r} 7 \\ \times\, 0 \\ \hline \end{array} \qquad \begin{array}{r} 8 \\ \times\, 0 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ \times\, 1 \\ \hline \end{array} \qquad \begin{array}{r} 9 \\ \times\, 0 \\ \hline \end{array}$$

**Divide
by 0?
No!**

**Divide
by 0?
No!**

**Divide
by 0?
No!**

**Divide
by 0?
No!**

$$\begin{array}{r} 3 \\ \times\ 0 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \times\ 0 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ \times\ 0 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times\ 0 \\ \hline \end{array}$$

$$9\overline{)\,0}$$

Divide
by 0?
No!

Divide
by 0?
No!

Divide
by 0?
No!

$$\begin{array}{r} 0 \\ \times\ 0 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ \times\ 9 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ \times\ 0 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \times\ 0 \\ \hline \end{array}$$

$9\overline{)54}$ $9\overline{)63}$

$9\overline{)72}$ $9\overline{)81}$

$$\begin{array}{r} 7 \\ \times\ 9 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ \times\ 9 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ \times\ 9 \\ \hline \end{array} \qquad \begin{array}{r} 8 \\ \times\ 9 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ \times\ 9 \\ \hline \end{array} \qquad \begin{array}{r} 2 \\ \times\ 9 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ \times\ 9 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ \times\ 9 \\ \hline \end{array}$$

$9\overline{)18}$ $9\overline{)27}$

$9\overline{)36}$ $9\overline{)45}$

$8\overline{)56}$ $8\overline{)64}$

$8\overline{)72}$ $9\overline{)9}$

$$\begin{array}{r} 8 \\ \times\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ \times\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ \times\ 9 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ \times\ 8 \\ \hline \end{array}$$

$8\overline{)24}$ $8\overline{)32}$

$8\overline{)40}$ $8\overline{)48}$

$$\begin{array}{r} 4 \\ \times\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ \times\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ \times\ 8 \\ \hline \end{array}$$

$7\overline{)\,56}$ $7\overline{)\,63}$

$8\overline{)\,8}$ $8\overline{)\,16}$

$$\begin{array}{r} 9 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \times\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ \times\ 8 \\ \hline \end{array}$$

$$7\overline{)28} \qquad 7\overline{)35}$$

$$7\overline{)42} \qquad 7\overline{)49}$$

$$\begin{array}{r} 5 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times\ 7 \\ \hline \end{array}$$

$6\overline{)54}$ $7\overline{)7}$

$7\overline{)14}$ $7\overline{)21}$

$$\begin{array}{r} 1 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ \times\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ \times\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \times\ 7 \\ \hline \end{array}$$

$6\overline{)30}$ $6\overline{)36}$

$6\overline{)42}$ $6\overline{)48}$

$$\begin{array}{r} 6 \\ \times\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ \times\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ \times\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ \times\ 6 \\ \hline \end{array}$$

$6\overline{)\,6}$ $6\overline{)12}$

$6\overline{)18}$ $6\overline{)24}$

$$\begin{array}{r} 2 \\ \times\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ \times\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \times\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ \times\ 6 \\ \hline \end{array}$$

$5\overline{)30}$ $5\overline{)35}$

$5\overline{)40}$ $5\overline{)45}$

$$\begin{array}{r} 7 \\ \times\ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times\ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ \times\ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ \times\ 5 \\ \hline \end{array}$$

$5\overline{)10}$ $5\overline{)15}$

$5\overline{)20}$ $5\overline{)25}$

$$\begin{array}{r} 3 \\ \times\,5 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ \times\,5 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ \times\,5 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \times\,5 \\ \hline \end{array}$$

$4\overline{)28}$ $4\overline{)32}$

$4\overline{)36}$ $5\overline{)5}$

$$\begin{array}{r} 8 \\ \times\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 7 \\ \times\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ \times\ 5 \\ \hline \end{array} \qquad \begin{array}{r} 9 \\ \times\ 4 \\ \hline \end{array}$$

$4\overline{)12}$ $4\overline{)16}$

$4\overline{)20}$ $4\overline{)24}$

$$\begin{array}{r} 4 \\ \times\, 4 \\ \hline \end{array} \qquad \begin{array}{r} 3 \\ \times\, 4 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times\, 4 \\ \hline \end{array} \qquad \begin{array}{r} 5 \\ \times\, 4 \\ \hline \end{array}$$

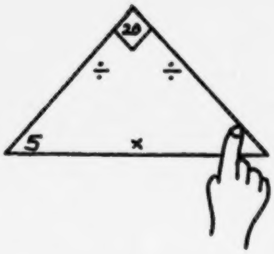
Finger Flash Card Pattern

This card may be used as a blackline master to create additional cards. Each card may be cut to create twelve triangular finger flashcards.

The finger flashcards are used in:

- Multiply to Check
- Partner and
- Fact Family

work throughout the division lessons.

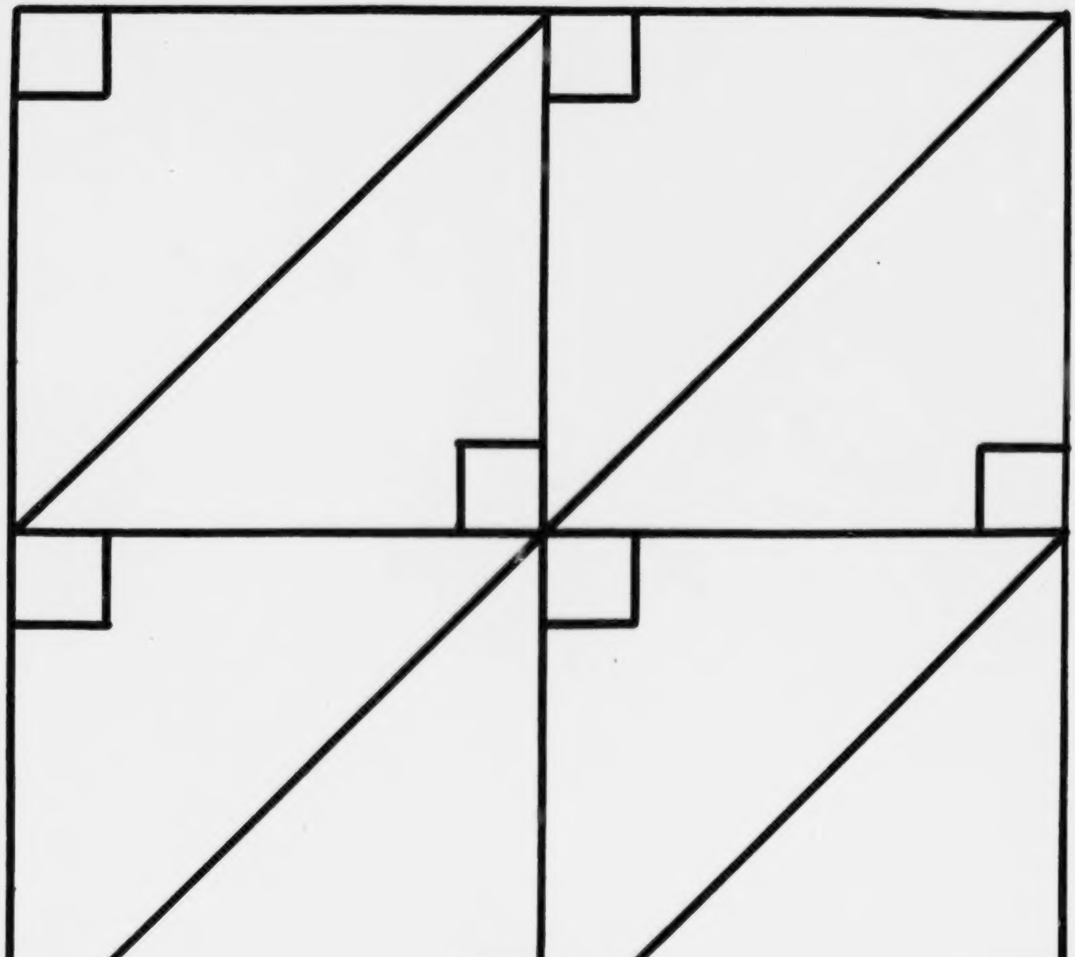


$20 \div 5 = 4$

because $5 \times \mathbf{4} = 20$.

(Lift finger to check.)

(For Finger Flashcards)



Sample:

Card for Showing Break Apart Facts

This card may be used as a blackline master.
It is used in the Break Apart Facts lesson.

Break Apart Facts

Break Hard Facts into Two Easy Parts!

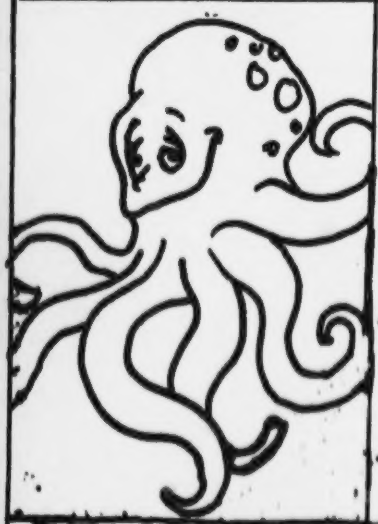
Blank Gamepath with Chance Cards

Cut out the 10 Chance Cards.

This sample board game is a popular small group activity, for home and school. Because each students could have their own deck of cards during game play, individual learning needs can be uniquely accommodated.

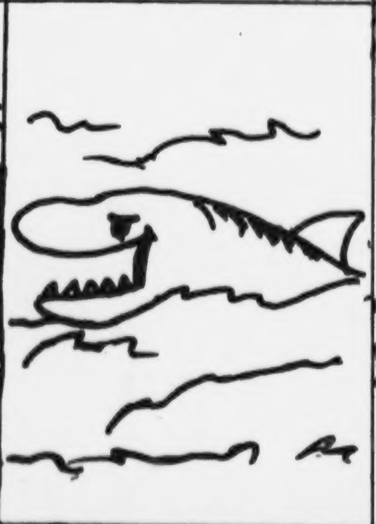
Specific directions for play appear in the overview to this section, "Using the Card Sets."

Friendly Octopus



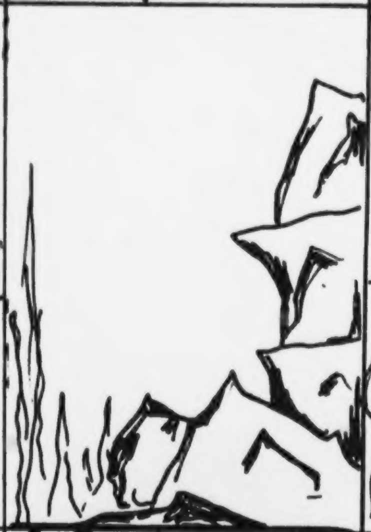
Go On 1 space

Escape the Shark



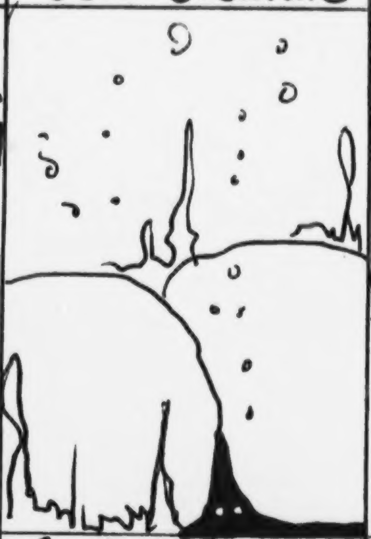
Go on 2 Spaces

Sharp Rocks



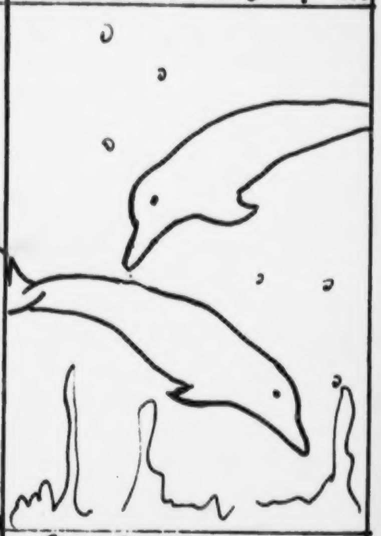
Go Back 2 Spaces

Sea Creature



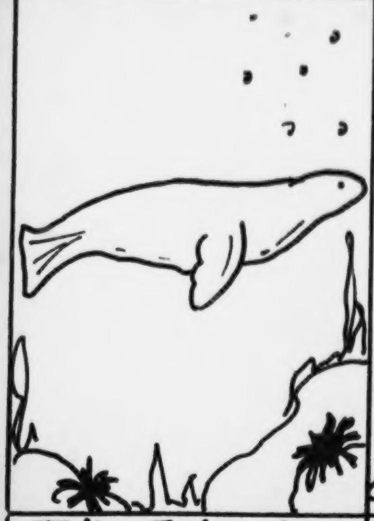
Go Back 1 space

Ride with Dolphin



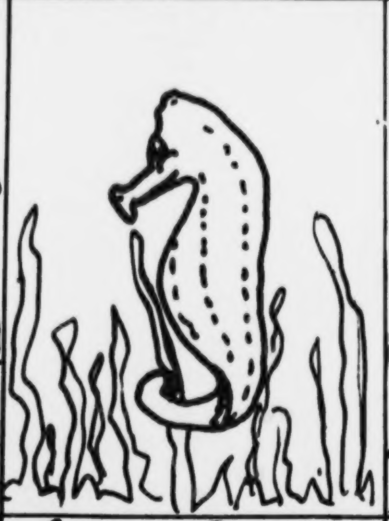
Go On 2 spaces.

Help Seal find home



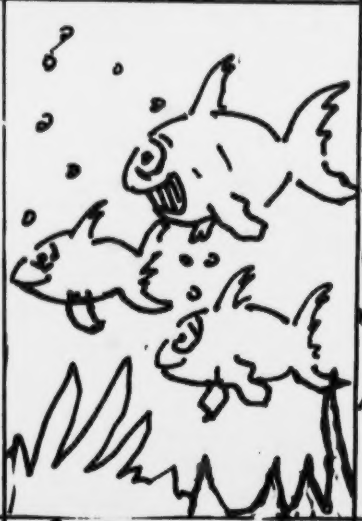
Take Extra turn

Follow the Seahorse



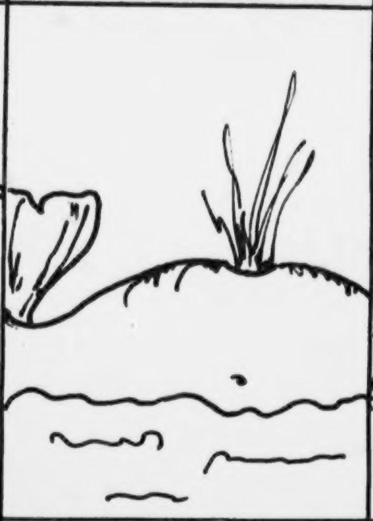
Go On 3 Spaces

School of fish



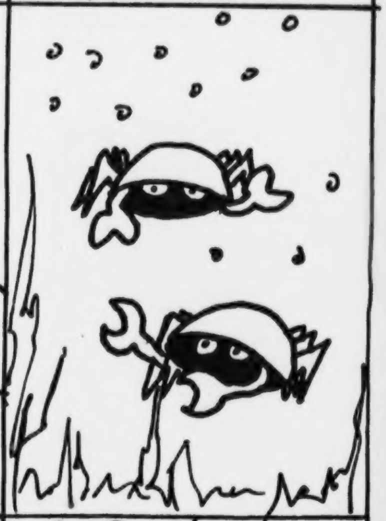
Go Back 3 spaces

Mean whale

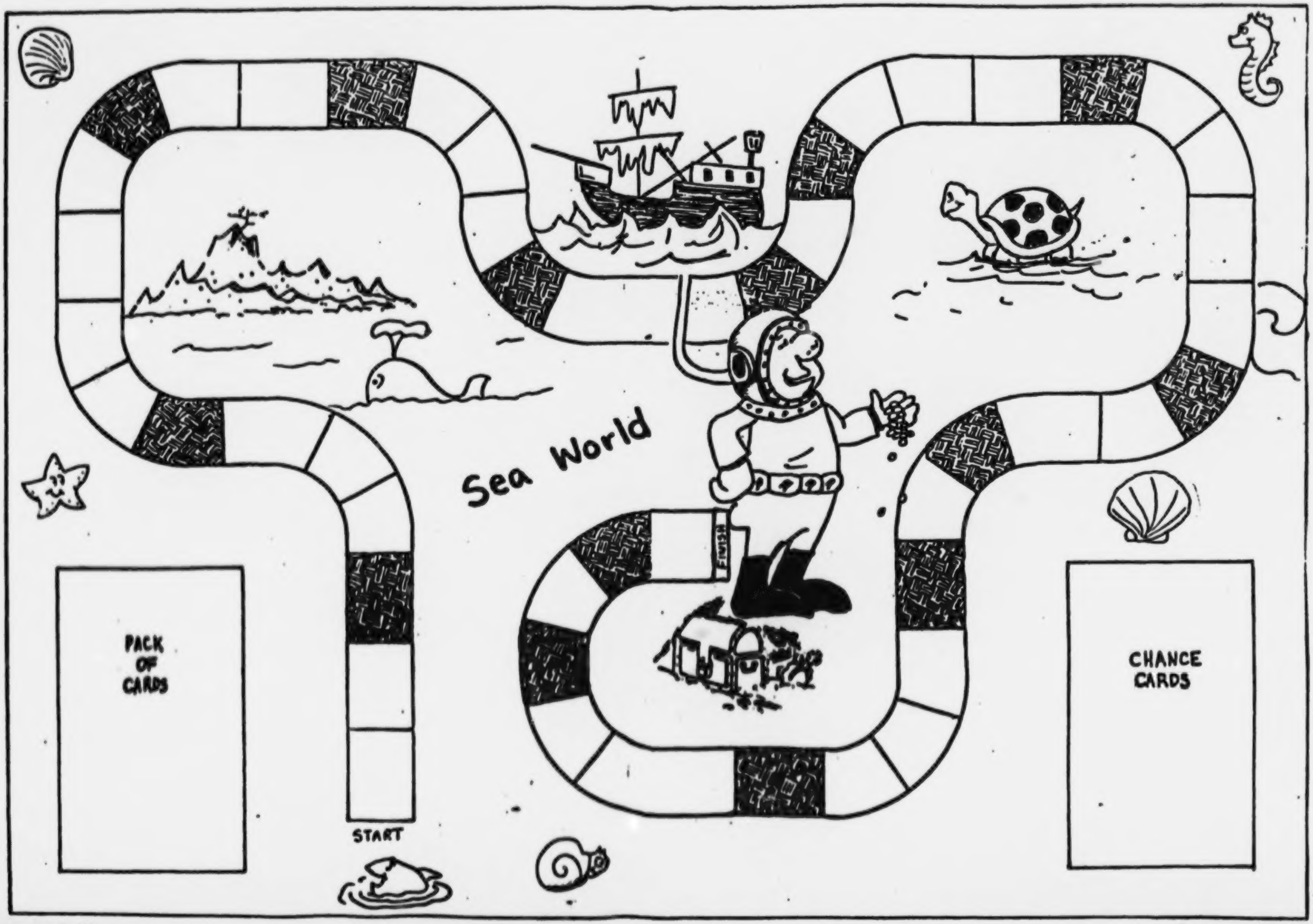


Miss a turn

Play with Crabs



Go Back 1 Space



Sea World
PACK OF CARDS
CHANCE CARDS
START
FINISH